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REPORTS ON THE SCIENTIFIC RESULTS OF AN
EXPEDITION TO THE SOUTHWESTERN HIGHLANDS
OF TANGANYIKA TERRITORY

I

INTRODUCTION AND ZOÖGEOGRAPHY

BY ARTHUR LOVERIDGE

WITH THREE PLATES

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No. 1.— *Reports on the Scientific Results of an Expedition to
the Southwestern Highlands of Tanganyika Territory*

I

Introduction and Zoögeography

BY ARTHUR LOVERIDGE

The following remarks are intended to serve as an introduction to the series of reports which have been prepared on collections made by the writer during an eight months' *safari* in East Africa on behalf of the Museum of Comparative Zoölogy.¹

There is much invertebrate material still awaiting study and on which it is hoped that further reports will appear. The mollusca are being utilized by Dr. Joseph Bequaert and W. J. Clench for their revisionary work on the genera of African land and freshwater shells. The paper on nematodes deals with only a portion of the parasitic worms collected. In addition to these invertebrates, and seven thousand, four hundred and eleven vertebrates, about half a ton of ethnological specimens were purchased, labeled and brought back for the Peabody Museum of Harvard University. The personnel of the expedition consisted of the writer and three native assistants, whom he had previously trained in the preservation of mammals, birds and reptiles.

OBJECTIVE OF THE EXPEDITION

The purpose of the journey might be said to be threefold. The primary object was to add to our very scanty knowledge of the herpetological fauna of the chain of mountains in Tanganyika Territory, commonly referred to as the southern and southwestern highlands, with a view to throwing light on the composition of the unusually interesting fauna occurring in the Uluguru Mountains of East Central Tanganyika.

As a secondary consideration special attention was to be paid to the zoölogically little known range flanking the eastern shore of Lake Nyasa and known to cartographers as the Livingstone Mountains. To the local inhabitants, however, this name is utterly unknown; they refer to its various sections by the name of the inhabiting tribe, thus the northern portion is called the Ukinga Mountains as the Wakinga dwell there.

¹This expedition would have been impossible without a grant of half the expenses from the Carnegie Institution of Washington, the sum involved originally voted by the Carnegie Corporation of New York. It is a great pleasure to tender our grateful thanks and acknowledgements to these institutions and their presiding officers, Dr. John C. Merriam and Dr. F. P. Keppel. (T. Barbour, Director.)

It seemed a pity to proceed on so expensive a *safari*, costly because so far removed from the railway and easy communication with the coast, without taking advantage of the opportunity to secure certain species still lacking in the collections of the Museum of Comparative Zoölogy; particularly species of uncertain taxonomic status whose position would be more firmly established if adequate topotypic series composed of both sexes could be secured. With this object in view a return itinerary was planned which would embrace certain type localities. This then formed the third motive of the trip.

Perhaps it would have been better to have attempted less. So great an area had to be covered, occasionally by such primitive methods of travel as walking, that inadequate time — in some instances only two days — had to be allowed in which to collect topotypes of such elusive genera as *Typhlops*, *Leptotyphlops*, and *Amphisbaenula*. At the same time a certain measure of success attended these efforts and topotypes of a large number of species unrepresented in any American museum were secured.

As to the second objective referred to above, *viz.* a zoölogical reconnaissance of the whole of the Livingstone Mountains, I failed, for only three weeks were spent in the range and all of these were in the temperate rain forest section surrounding Madehani at the northern end of Lake Nyasa. My reasons for abandoning a thorough examination of the range were numerous. After a couple of short journeys southwards along the range I came to the conclusion that anything like a comprehensive study of the fauna would be impracticable in the time at my disposal. The steepness of the mountain sides to be negotiated and the wearisome detours necessitated by some physiological feature were such that in a day's march porters could not cover much more than five miles as the crow flies. Probably a straightforward march down the centre of the range would occupy between one and two months. Anyone attempting a zoölogical survey of the Livingstones should be prepared to devote at least six months to the undertaking. Judging by the number of new forms found at Madehani, a thorough investigation would be productive of new races or species, but these would be more likely among the mammals and birds than among the reptiles.

The fauna is not rich and is unlikely to differ in any important respect from that of the adjacent Ubena Highlands through which we passed, or on the other hand from that of the Shiré Highlands and Nyasaland Plateau into which it merges. Such parts as I saw were subjected to intensive cultivation, the valleys and hilltops were in

places quite thickly populated. The Wakinga are exceptionally industrious and grow European wheat so successfully that natives from all the surrounding country, even a hundred miles away, proceed to Ukinga to purchase flour. Most of the uncultivated ground was rolling grassland over which flocks of cattle and goats wandered in charge of little goatherds who were unhampered by clothing. Missionaries, whose work took them on itineraries in the mountains, as well as the Forest Officer at Tukuyu, informed me that there were no areas of primary forest left except those in the vicinity of Madehani where I camped.

The southwestern and southern highlands from Rungwe east to the north end of Lake Nyasa and northeast to Iringa, have a mean altitude of about 4,000 feet, though Rungwe Volcano itself rises to 9,850 feet and the highest peaks of the Ukinga Mountains are 9,600 feet.

Except for their lower altitude and less precipitous slopes, the highlands south of Iringa are not greatly dissimilar from parts of the Ukinga Mountains. They consist of a pleasantly undulating hilly country though in places steep-sided hills occur and the whole plateau is bounded in parts by lofty escarpments. The undulating country is largely grassland where the Wahehe graze their herds; the steeper hills are often clothed in dense scrub and bush of secondary growth while surviving patches of virgin forest are rare and widely scattered. This latter feature distinguishes them from the greater areas of rich primary forest occurring on Rungwe and the Ukinga range.

It is more than a coincidence that the heavily forested areas are those possessing the greatest rainfall; thus the mean rainfall at Iringa, based on records of a period of eleven years, is 26.57 inches; that of Tukuyu, lying near the foot of Rungwe Volcano, is 91.51 inches, this figure being the mean for seventeen years. This is the greatest rainfall for any part of the Territory and may in part be attributed to Tukuyu being situated between the great lakes of Nyasa and Tanganyika, whose heavy evaporation under a tropical sun is precipitated by the adjacent forested peaks. It is interesting to note that the next highest rainfall records are from Amani in the tropical rain forests of the Eastern Usambara range where the records kept for a period of eighteen years give an average of 80.09 inches per annum.

No figures are available for the Uluguru Mountains lying south of the Usambara and northwest of Iringa but they are not likely to be far short of the Amani average. The Uluguru support a similar forest to the Usambara, and are important as being the most southerly

area of tropical rain forest of any extent. This forest is readily distinguishable from the temperate rain forest of the mountains to the south. The highest peak of the extensive Uluguru massif reaches 8,000 feet. On their northern aspect these mountains rise relatively steeply from the plains, but to the south they pass gradually into hilly country not unlike that of the Iringa Highlands.

ITINERARY

The following detailed information concerning the camps at which collecting was carried on, has been arranged in the order of the itinerary; the same arrangement has been observed in the listing of the material in the systematic reports dealing with the specimens collected.

After the name of the locality, the approximate altitude of the camp is given, followed by more precise data as to the position of the camp and the period during which collecting was carried out in the vicinity. This is intended to serve as a check to the dates on the labels accompanying each specimen in case the figures become defaced or illegible with the passage of time.

The climatic conditions are of such outstanding importance in the collecting of lower vertebrates that the meteorological aspect of each camp during our stay is given in detail.

Mention is then made of some characteristic forms or rare species to enable a taxonomist to visualize the faunistic features of the neighborhood.

In the systematic papers dealing with the terrestrial vertebrates, the local names applied by the various tribes to the creatures taken in their vicinity, have been inserted. To be confident of absolute accuracy in regard to such names one really should live among the particular tribe for many years; this not being possible I have endeavoured to take reasonable precautions to secure accuracy but it is not to be expected that some errors will not have crept in. Every native is not a zoölogist but every native in his desire to be obliging is apt to call an animal by the name he thinks most applicable, if he should be unfamiliar with the correct one. To avoid such errors, specimens were submitted to groups of natives who argued or discussed alternative names before submitting the final opinion to me. For example, at the conclusion of my stay at Madehani, the whole congregation visited my camp at the end of the morning church service and were shown an example of each species taken in the neighborhood. At Iloilo, through the exceeding kindness of Herr Gemusens, I was

able to exhibit representative specimens of the Ilolo and Rungwe collections to the whole school of the Moravian Mission and had the additional advantage of Herr Gemusen's own unrivalled knowledge of the Kinyakusa tongue.

When a species has been recorded previously from any of the localities visited during the course of the trip, this fact is entered under the heading *Distribution*, together with the name of the author who recorded it.

Dar es Salaam, Dar es Salaam District, Usaramo. Alt. 100 feet.

The capital and chief port of entry of Tanganyika Territory.

In hotel November 4th to 7th and 18th to 19th, 1929.

A little rain fell.

My time being fully occupied in unpacking crates and repacking their contents into safari boxes of portable size, getting licenses, etc., I made no attempt at collecting. Salimu, however, was sent to get large series of *Lygodactylus p. picturatus* and *Cryptoblepharus b. africanus*, in which he was successful.

On our return from Bagamoyo we reached Dar es Salaam at 3.30 p.m. and left at 11.30 next morning having railed all equipment in the interval.

Bagamoyo, Bagamoyo District. Alt. 100 feet.

Situated on the east coast opposite Zanzibar and forty miles north of Dar es Salaam.

Camped from November 8th to 18th, 1929.

During the last week of October two heavy showers had occurred and each morning from the 10th to the 14th one or two rainstorms swept the town but quickly passed so that an hour or two later it was difficult to believe that rain had fallen, so rapidly was it absorbed by the hot dry sand.

In consequence of this aridity the only spots which rewarded the digger were at the base of bananas in the native gardens a little further inland. These plants seem unable to flourish at Bagamoyo unless planted in a pit. Half-a-dozen such pits were examined and yielded *Hemisus m. marmoratum* squatting upon its eggs or tadpoles in the moist soil at the base of the bananas. Several *Typhlops s. mucruso* were secured in this type of environment.

Following the Ngeringeri road after it crosses the Ruvu River, one reaches open woodland about three miles on the far side of the ferry. It was here that most of the bird collecting was done and a *Pachyoccyx validus* shot. Parrots, plantain-eaters and hornbills occur, though they were not abundant; on the other hand several species of bee-eaters were very common.

Bagamoyo is type locality for *Leptotyphlops braueri* (Sternfeld), *Rhampholeon boettgeri* and *Hylambates argenteus* of Pfeffer; it was in the hope of securing topotypic series of these that Bagamoyo was visited, but without success.

Morogoro, Morogoro District, Ukami. Alt. 1,628 feet.

A station on the Central Railway of Tanganyika, 126 miles west of Dar es Salaam. Principal town of the Ukami country situated at the foot of the Uluguru Mountains.

In hotel November 20th, 1929.

Only a shower or two had fallen during the month and everything was very parched and dry. It was the more surprising therefore to secure close to the station and with little difficulty a topotypic series of *Megalixalus loveridgii* (syn. of *M. fornasinii*) including a number of young specimens.

A couple of hours spent in turning logs, stones and debris gave no results though in digging at the base of a banana a queen soldier ant or *siafu* (*Dorylus helvolus*) was unearthed much to the annoyance of the myriads of workers and warriors. Dr. W. Morton Wheeler, who kindly made the identification, tells me that this is the first female of its species in any collection in the United States.

Mpwapwa (Mpapwa, Mpapua), Dodoma District, Ugogo. Alt. 4,000 feet.

Situated eighty-five kilometres east, slightly southeast, of Dodoma and about ten miles north of Gulwe (Igulwe) station on the Central Railway.

Camped from November 21st to 23rd, 1929.

At this place the lesser rains usually commence about November 15th but the countryside was desperately parched at the time of my arrival for only one small shower had fallen and that a week before our visit. The Veterinary Department very kindly placed their newly built and unoccupied office at my disposal for the two and a half days that I spent at Mpwapwa. This office faces a belt of fine trees, wild fig predominating, which fringe the water course that comes down from the 6,000 foot range behind. The river was, of course, dry, but a very small stream, whose source was a spring in the river bed, trickled down the course.

The domestic bananas opposite the office were devoid of frogs, and their roots, grounded in sandy soil, were dry. Along the edges of the stream we secured a very few young *Rana f. chapini* and near the head of the valley, where conditions were moister, hundreds of *Arthroleptis xenodactylus* hopped about among the dry leaves which formed a belt along either side of the stream. A great many dead tree trunks, situated more or less near the stream, were broken open and examined and the ground beneath them dug up but only one of the whole number produced any reptiles. The excavation of this one resulted in the removal of a good cartload of rubbish and uncovered a *Paragonatodes quattuorseriatus*, *Amphisbaena* sp. n., *Melanoseps ater* and *Prosymna ambigua*. Of these the lizards as well as *A. xenodactylus* are creatures associated with mountain rain forest and it is obvious that at Mpwapwa we have a remnant of virgin forest fauna in a region that is fast undergoing desiccation.

To the east of the office there is open thorn bush growing on a volcanic ash soil of rufous color; in places sand overlays the soil to a depth of six inches

and everything was so dry that the soil was like caked dust. A broad river bed occupied the open valley bottom and on one bank of this was the charred stump of an old tree which yielded results. All the other dead trunks and stumps in the vicinity were non-productive without a single exception. We spent two hours in digging out the decayed roots of this giant tree and removed a ton of soil altogether. It struck me as curious that so many species should be represented by only single specimens. The catch from this one tree was: *Rhinocalamus dimidiatus* (topotype), *Causus defilippi*, *Hemidactylus w. wernerii*, 2 *Riopa s. modestum* (topotypes), 3 *Ablepharus wahlbergii*, 2 *Bufo r. regularis*, 3 *Arthroleptis s. stenodactylus* besides many invertebrates—scorpions, centipedes and polydesmids.

Mpwapwa is also type locality for *Geocalamus modestus* and *Arthroleptis scheffleri* in addition to the topotypic species secured.

Kilimatinde, Manyoni District, Ugogo. Alt. 3,591 feet.

Situated fifteen kilometres south of Saranda station on the Central Railway and southeast of Manyoni which is 4,160 feet.

At Mission on November 26th and 27th.

The rains had failed except for a very few showers, in consequence everything was parched and the fields of stubble were blanketed with dust; the areas of red volcanic soil were somewhat more compact.

Five hyrax (*Heterohyrax brucei prittwitzi*) were shot one evening in this, its type locality; they yielded a rich harvest of parasitic worms. Other mammals seen were *Papio neumanni*, *Cercopithecus a. johnstoni*, *Myonax grantii*, *M. s. proteus*, warthog, bushbuck, duiker and dikdik, the last of which were very common.

Reptiles were scarce except for *H. mabouia*, *A. a. dodomae* and *M. v. varia* which occur upon the rocks in the dry watercourses. A *Chameleon d. dilepis* and *Chiromantis p. petersi* (topotype of *C. pictus* Ahl) were taken upon a Manyara hedge. The only snakes seen were two *Psammodromus biserialis* and a *Naja nigricollis*.

Saranda, Manyoni District, Ugogo. Alt. 3,511 feet.

A station on the Central Railway between Dodoma and Tabora.

Camped from November 28th to 30th and December 18th to 19th, 1929.

No rains had fallen at the time of our first visit though daily threatening and dust storms whirled across the countryside. The types of country in the vicinity of Saranda are numerous, open thorn bush in the vicinity of the station, miles of almost impenetrable scrub to the south while maiombo bush of varying density flourished on the dry and stony escarpment to the northwest.

Though a halt was only made at Saranda to change from train to motor lorry it was hoped to secure topotypic material of *Guttera edwardi granti* and *Lygodactylus manni*, two species of doubtful status. In this we were success-

ful, with the result that *granti* which has been discredited, is considered valid and *manni* becomes a synonym of *picturatus*.

Unyanganyi (Kinjanganja), Singida District. Alt. circa 4,500 feet.

Situated between Singida and Kondoa Irangi due north of Saranda.

Camped from December 3rd to 9th, 1929.

The first of the lesser rains fell on the afternoon of the 5th., but was quickly absorbed by the parched ground though some pools remained in the *mbugwe*. It rained steadily for a couple of hours on the night of the 5th but remained fine thereafter.

This place was visited, since "Kinjanganja am Turu" is the type locality for the smallest and supposedly one of the rarest skinks in East Africa, *Ablepharus megalurus* Nieden. Kinjanganja is synonymous with Unyanganyi, no definite locality but an area of the former German district of Turu, partly inhabited by the Wanyaturu and Wataturu. In the Unyanganyi country there are various scattered groups of huts usually known by the name of the petty chief or jumbe. The jumbes whose names appear on German maps have since died or been superseded and some are almost forgotten already. My camp was half-a-mile south of Jumbe Abdulla's of Kifumbu. There are a group of shops beside the main road from Singida to Kondoa Irangi, about fifteen miles east of the former and I was assured that this was the approximate centre of Unyanganyi. This village is at the north end of an "island" of raised ground with a kopje occupying the centre, the raised ground is mostly red volcanic ash though so sandy in spots as to be like a desert. It is surrounded by a very extensive *mbugwe* (plain) of black (or gray) cotton soil which being very desiccated at the time of our visit is full of fissures. The plain is a mile or more broad and is backed to the north and west by a steep escarpment.

Drinking water was obtained from holes dug ten feet deep in this *mbugwe* and was like thick soup by reason of the gray mud in suspension. Each afternoon clouds collected in the east and hurricanes of wind raised "dust devils" which whirled through camp leaving one choking, and a deposit of dust, sand and straws over everything.

Masiliwa, Turu, Singida District. Alt. circa 4,500 feet.

Situated just south of Jumbe Ali's village, Kalingwa on the Singida to Kondoa Irangi main road a day's march east of the camp at Unyanganyi.

Camped on the night of November 9th, 1929.

Several showers had occurred in this dry thorn-bush and rock-strewn country. Porters arrived at 3 p.m. with the loads and a heavy downpour lasted from 4 till 5 p.m., then steady rain from 7 p.m. through most of the night.

Rhinoceros were said to be a great pest here, waiting about the water holes and menacing natives and cattle; they certainly had wrought havoc with the manyara hedge fifty feet from my tent. Dikdik were seen and signs

of larger game. During the night a leopard remained very close to camp, coughing three times during that period. Lions were heard in the distance.

After dinner I took a lamp and walked to and fro over a recently hoed field resulting in the capture of a large series of several burrowing amphibia *Rana delalandii*, *Hemisus marmoratum guineensis* and one *Breviceps mossambicus*. Half-a-dozen of the latter were taken the following morning in open maiombo bush a few miles away, also a Boomslang was found swallowing a *Leptopelis bocagii* and had another in its stomach; it was of interest to note that all four species taken in this arid country were of different genera yet provided with shovel-shaped metatarsal tubercles to enable them to "dig-in" during the dry season.

Handa, Usandawi, Kondoa Irangi District. Alt. circa 4,000 feet.

On a cross-country trail from Kalingwa to Mangasini.

Midday halt on November 10th, 1929.

An open area cleared of maiombo bush for cattle grazing. A series of deep water holes in the valley bottom are surrounded by thorny fences or *bomas* of piled-up thorn bush. To the south of these water holes, acacia thorn bush of considerable extent followed by open *mbugwes*; a promising game country but none seen.

Maji Maluku, Usandawi, Kondoa Irangi District. Alt. circa 4,000 ft.

On a cross-country trail from Handa to Mangasini.

Camped on the night of November 10th, 1929.

Slight showers had fallen and one storm during the night of our stay which was from about 4 p.m. to 7 a.m.

Tents were pitched beneath a baobab, one of several in a large area of cleared land in which were a dozen native *tembes*. To the south this area was surrounded by thorn bush on gray soil, to the north some maiombo forest on red soil. Water is said to be very scarce hereabouts.

Though I went out with a local native from 5 to 7 p.m. little of interest was seen and the only reptiles collected were a gecko (*H. w. werneri*) and an Egg-eating Snake (*Dasypeltis scaber*).

Mangasini, Usandawi, Kondoa Irangi District. Alt. circa 4,000 feet.

Mangasini is a native corruption of the word Magazine and was given to the village which was used as a store base by the German troops during the earlier part of the East African Campaign. A few miles distant is the German farm of Kwa Mtoro, type locality of Werner's *Mabuya obsti*, a synonym of *M. quinquetaeniata*. It was with the object of securing topotypic material of this skink that Mangasini was included in the itinerary but no trace was found of this skink on the kopjes about Kwa Mtoro though it undoubtedly occurs there.

Camped from December 11th to 16th, 1929.

Hardly any rain had fallen up to the time of our arrival and the whole countryside was parched and dusty. At 5 p.m. on the 12th it began to rain and after sunset there was a terrific thunderstorm and the rain came down in torrents continuing without cessation until noon of the following day. This storm awoke the amphibian and insect life and enabled us to secure series of things which under normal conditions would have been impossible.

A small undescribed species of *Bufo* was found in the *mbugwe* where thirty were collected, here also *Rana floweri* of the Sudan was found in surprising numbers. This was also the case with *Chiromantis p. petersi* for these arboreal frogs assembled and started making their froth "nests" about the accumulations of rain water.

The large black scorpions (*Pandinus cavimanus*) were common, as also the Trombid mites of a plush appearance which the natives call "the child of the rain" as they make their appearance after showers.

Kikuyu, Dodoma District, Ugogo. Alt. 3,900 feet.

Kikuyu is but a mile and a half south of Dodoma whose physical characteristics I have recently described (Loveridge, 1928, Proc. U. S. Nat. Mus., 73, Art. 17, pp. 3-4). This Kikuyu should not be confused with Ikikuyu to the south of Gulwe station where I collected in 1923. Specimens collected from here are just as much topotypes of species accredited to Dodoma as if they were so labelled as they were hunted in the intervening area.

Camped from December 21st to 26th, 1929.

The weather was fine for three of the four days spent here but little collecting was done, the halt before proceeding south being made to enable me to purchase Wagogo ethnological material and to pack and dispatch to the coast the results of the past six weeks collecting. We arrived late in the afternoon of the 21st and left before 9 a.m. on the 26th, motoring to Iringa which was reached at 10 p.m. the same night.

Topotypes were collected of *Elephantulus renatus*, *Pedetes dentifer* and *Agama a. dodomae* as well as an undescribed species of *Leggada* found running about the road at night.

Dabaga, Uzungwe (Utschungwe) Mountains, Iringa District. Alt. 6,000 feet.

Situated forty miles south of Iringa in south central Tanganyika though frequently spoken of as the southwestern highlands. Uzungwe was spelt Utschungwe by the Germans and undoubtedly Uhehe was often given as a type locality for things coming from this region where Wahehe are settled. The altimeter reading for the camp, situated half-a-mile below Houter's farm, was 6,025 feet which was in accordance with various survey calculations made in the vicinity.

Camped from evening of December 27th, 1929 to January 4th, 1930.

Sunday was the only entirely fine day during the week; once it rained almost continuously for thirty-six hours. As a general rule the mornings

were fine with rain between noon and 3 p.m. and frequently rain again at 5 or 6 p.m.

The country is composed of rounded rolling hills covered (at the time of my visit) with freshly springing grass and sometimes with shrubs. Many of the hills have clumps of trees scattered here and there with dense thickets at their base, others are studded with shrubs for the most part under six feet in height, the dominant kind being a species of *Protea*. Others again are densely clothed in stunted forest, the trees twisted and gnarled by the action of lianas and rarely exceeding thirty feet in height, the undergrowth of brambles and, on the outskirts bracken, is so dense that it is quite impenetrable for collecting purposes. Though scheduled as rain forest it can hardly be considered primary tropical rain forest and the timber is useless except for fuel.

Dabaga becomes the type locality for three new reptiles which we collected, the finest being a new tree viper, *Atheris barbouri*. The others were races of *Lycophidion capense* and *Chamaeleon werneri*. Topotypes of *Ch. goetzi* and *Ch. tempeli tempeli* were also secured.

Kigogo, Uzungwe Mountains, Iringa District. Alt. 6,000 feet.

Altimeter readings showed considerable variations attributable to rain and temperature fluctuations. The average was just under 6,000 feet but Survey Department reading for points 500 yards below and above the camp were 6,090 and 6,234 feet respectively.

Camp was actually situated a hundred yards behind the Forest Officer's house which is near the extreme southern end of the Uzungwe Mountains and a few miles from Mufindi. I was advised that this was the only large remnant of forest in the southern part of the range. During my stay much assistance and kindness was given to me by Mr. Fraser, the Forest Officer. Kigogo takes its name from the river which flows past the Forestry quarters, plantations and nurseries.

Camped from January 11th to 31st, 1930.

Only one or two days were entirely free from rain though much of it was in the form of mist or fine driving rain. There was more sunshine between showers than one experienced at the same altitude in the Uluguru Mountains; drying of skins was noticeably better.

While the country might still be called undulating, many of the hillsides were more precipitous than at Dabaga. Shrubs were also scarcer, the hillsides being covered with bracken and grass and the tops capped with forest. Over considerable areas the forest survives on the caps of the hills and is both higher and more open than the forest in the immediate vicinity of Dabaga. Bamboo was apparently much more extensive and quite large patches of it occurred on some of the hillsides. A striking feature of this temperate rain forest was the abundance of moss which clothed the trunks and branches of the trees and from which long wisps of moss depended.

As the result of our visit Kigogo becomes type locality for five new forms or species of *Cryptomys hottentotus*, *Francolinus squamatus*, *Apalis thoracica*

and *Chamaeleon*, paratypes of three other new things were also taken there.

Only four species of reptiles were at all abundant, these were: *Duberria l. shiranum*, *Trimerorhinus t. tritaeniatus*, *Mabuya v. varia* and *Chamaeleon tempeli*, topotypes of *Ch. w. werneri* were also taken as well as the interesting limbless lizard *Melanoseps ater*.

Amphibia were scarce except for three species, viz. *Arthroleptis minutus*, *A. parvulus* and *Hyperolius marginatus* besides which only six other species were taken, the rarest being a new race of *Bufo taitanus*.

Madehani, Ukinga Mountains, Rungwe District. Alt. 7,200 feet.

Camp was made among the ruins of the German Lutheran Mission a hundred yards south of the village which is situated in the mountains at the north end of Lake Nyasa.

Camped from noon on February 13th to daybreak on the 27th, 1930.

The average of hours of sunshine per day during the fortnight was certainly not more than two. The routine of meteorological conditions was fairly regular during our stay. The day would dawn with a clear sky; about 8 a.m. the sky would be obscured by fleecy white clouds. An hour or two later a white mist would come creeping up from the lake, wisps of it would blow past about 10 a.m. and gradually thicken until 11 a.m. by which time we would be enveloped in a blanket of fog, raw and especially unpleasant if accompanied by a cold wind. By noon all the trees would be dripping with precipitated moisture, one's clothes quite wet by precipitation. At 1 p.m. a crack of thunder, followed a few minutes later by a downpour of rain, at times the latter continued until 4 p.m. or alternatively in a series of heavy showers with intervals of sunshine lasting from ten to fifteen minutes. From 4 till 6 p.m. it would not rain but the sky would be hidden by clouds, the vegetation would be sodden and everything clammy to the touch. When darkness fell at 7 p.m. it would begin to rain softly though on a few evenings it held off till 9 p.m.; rain would continue on and off till 3 or 4 a.m.; sometimes, but not generally, heavy downpours occurred during the night. Naturally both collecting and preservation of specimens was difficult under these conditions, and but for Dr. James P. Chapin's valued suggestion that I should take a Primus stove to dry the skins, they would undoubtedly have suffered.

Four new races of mammals and one of birds were found at Madehani, some of which at least apparently owe their differentiation to heavy rainfall and moist conditions. The genera involved are *Aethosciurus*, *Praomys*, *Otomys*, *Claviglis* and *Illadopsis*.

The forest consisted of fine large trees set far apart so that there was a more or less dense undergrowth of shrubs and grass. The trees were often heavily laden with moss and ferns. Here and there along the forest edge, or on the sides of ravines in the forest, were large patches of bamboo. A road traversed both forest and bamboo for a couple of miles and it was along this road, or in cultivated patches of former forest land, that we secured the series of *Crotaphopeltis h. tornieri* and *Atheris barbouri*, all the other snakes came

from the open grasslands and gardens. *Lygodactylus angularis* occurred on big trees along this road and on smaller isolated trees in what was obviously cleared forest land. The new species of chameleon as well as the three other kinds were found on shrubs or trees at the forest edge.

The fern-grown and most promising looking banks of the streams within the forest were entirely unproductive of amphibian life. We failed to find *Nectophrynoides vivipara* of which these mountains are part type locality. *Arthroleptis reichei* lived in the forest and *A. schubotzi* at the base of wild bananas just outside the forest. Wild bananas were abundant two miles down the road from our camp but a close examination of them failed to reveal any frogs. The *Hyperolius marginatus* were captured along the sides of swiftly-flowing streams in the valley bottoms of the grasslands without the forest, *Rana f. angolensis* was in a similar habitat while *R. f. merumontana* was taken in the grasslands and *A. parvulus* in boggy areas of the same. These bogs were studded with sundew plants.

Mwaya, Lake Nyasa, Rungwe District. Alt. 1,700 feet.

Much of the material from this locality is labelled "Near Mwaya" as camp was pitched three miles west of the village and lakeshore to avoid a percentage of the mosquitoes. Mwaya is just north of Karonga, Nyasaland on the north-west shore of Lake Nyasa, actually the village is separated from the lake by about a mile of swamps.

Camped from March 1st to 11th, 1930.

Rain was fitful; at first we had several entirely fine days with heavy rain at night, this period was succeeded by one in which downpours lasting an hour or more occurred both morning and afternoon; during the last two days of our stay there was almost continuous rain. When not raining the sun shone with great force.

As one descended from Madehani in the Livingstone Mountains, the last thousand feet or so closely resembled the hills just north of Kilosa station; the same open maiombo bush, the same red soil and gravelly paths. At 2,300 feet one passed through a ravine bordered by big trees where butterflies typical of the Kilosa fauna — *Euphaedra neophron* and *Hamanumida daedalus* — settled upon the leaf-strewn path. Emerging from the ravine we marched for miles through sword grass precisely like that to be found on the Kilosa flats.

Camp was made beside the Mwaya-Tukuyu road at a village named Ndora where banana plantations were very extensive. The Mbaka River, type locality for a race of waterbuck described by Matschie, flowed close by and the rank vegetation which smothered its banks might have been that of the Myombo River near Kilosa.

To the south stretched plains of which great patches were inundated at this season and on part of which rice was being cultivated. All the animals collected at Mwaya were common to Kilosa except three forms of antelope which had their counterparts in Usagara.

In the main the birds were also those of the Kilosa region but with an admixture of southern forms.

The snakes were all common and widely distributed species with the exception of *Dromophis lineatus*, *Rhamphiophis acutus* and *Vipera superciliaris*. The taking of the two last mentioned species provided the first records for Tanganyika Territory.

There was little of interest among the frogs except the taking of *Arthroleptis whytii*, *Leptopelis johnstoni* and *Megalixalus brachynemis*, all of which had been described from near Karonga just across the border.

Tukuyu, Rungwe District. Alt. 5,000 feet.

In 1918 Neu Langenburg reverted to its native name of Tukuyu; it is the capital town of the Rungwe District but is about twenty miles southwest of the mountain which gives its name to the district. It is forty miles by road to Mwaya on Lake Nyasa.

At rest house from March 12 to 14th, and April 18 to 23rd, 1930.

Frequent showers and driving mist occurred during our stay.

These brief stays at Tukuyu on the way to and from Rungwe and the Porotos were made to replenish stores, arrange for transport, and to permanently pack specimens obtained at Mwaya and Rungwe. As the transport expected on the 21st failed, though hampered by uncertainty as to its arrival, we managed to get some collecting done.

The region about Tukuyu consists of rolling, hilly country with a vegetation and climate strongly reminiscent of the Kikuyu highlands in the vicinity of Nairobi. There is no forest but a great deal of planting of introduced trees has been accomplished. One ravine has been laid out as a public garden by a past administrator — Major Carveth Wells, and wild bananas and other local forest plants or trees flourish in profusion and form a centre of attraction for forest-living birds which would be absent otherwise.

Typhlops s. mucruso and *Boaedon lineatus* were the only snakes collected but Sternfeld lists six species, among them two very doubtful ones, viz. *Chlorophis irregularis* and *Psammophis notostictus*, one wonders if these should not be *Philothamnus s. dorsalis* and *Psammophis sibilans* both of which were common at Mwaya.

Of amphibia we collected *X. poweri*, *B. r. regularis*, *R. f. angolensis*, *R. m. mascareniensis*, *A. whytii* and saw *A. schubotzi*. Nieden lists three of these and adds *P. bifasciata*, *R. oxyrhynchus* and *Phrynobatrachus acridoides*.

Ilolo, Rungwe District. Alt. 4,600 feet.

Camp was made for a week-end beside the village just below the Rungwe Mission and three miles below my subsequent camp in the Nkuka Forest. There is an uplands fauna at Ilolo, as distinct from that of the forest, and during the earlier part of my stay in the forest children came up from the village with specimens which were duly labelled "Ilolo," thus for the period

from March 24th to April 17th labels may read either Ilolo or Nkuka Forest for the same date. Once or twice Salimu or I went down to Ilolo and collected birds in the vicinity either coming or returning.

March 15th, 16th, 24th to 31st and April 1st to 17th, 1930.

Rain daily and heavy. Empty four-gallon kerosene drums placed anywhere beneath the awning of my tent were full and running over on the morning of the 16th.

While the village is concealed among dense banana plantations, the surrounding country largely consists of open grassland savannah with a few scattered shrubs here and there; the general appearance being very similar to types of country in the vicinity of Nairobi. In the direction of the Poroto Mountains there is a steady rise and both streams and rivers tend to cut deep ravines which become choked with shoulder-high grass, brambles and stunted trees.

Nyamwanga, Poroto Mountains, Rungwe District. Alt. 6,400 feet.

Nyamwanga is an Usafwa (Usafua) village a hard day's march north of Tukuyu. It is sometimes known as Marupindi's village after the name of the chief.

Camped on the nights of March 17th and 20th on the way up and down from Ngosi Volcano.

There was heavy rain on both the afternoons that I was at this camp, it was cloudy and dull in the intervals between downpours.

Nyamwanga is situated in rolling grasslands, rising steeply to the mountains which surround it on three sides. Shrubs are common but trees are scarce in the immediate vicinity though plentiful three miles away; doubtless they have been cut for fuel and timber in the neighborhood of the village.

Not a snake or a lizard was brought in by the natives; on the other hand four species of chameleons were so abundant that I bought over a hundred in two hours among which were a good series of topotypes of *C. fülleborni* and a few of a new kind.

Frogs also were plentiful but no great variety of species so that it was necessary to limit purchases which were at the rate of a dollar per four hundred. At this price the children considered themselves well repaid, i. e. an East African cent for each frog.

From the above it will be seen that the people, who see very few Europeans, were friendly at unusually short notice and are quite keen to get money. Perhaps rather too keen, as the chief's clerk and tax collector visited my tent about midnight with a view to investigating the cash box; failing to achieve this, however, he spent six months in jail.

Ngosi Volcano, Poroto Mountains, Rungwe District. Alt. 7,170 feet.

The Crater Lake of this well-known volcano was Nieden's type locality for *Rana fülleborni* and *Arthroleptis reichei* and was visited with a view to

securing topotype series in which we were successful; it is a three hour's march from Nyamwanga.

Camped on the narrow lip of the crater from March 18-20th, 1930.

We arrived at noon on the 18th in driving rain which continued without intermission until 9 a.m. the following day. It rained on and off during our stay with a minimum of sunshine. The sodden condition of the forest during the rainy season probably causes many of the birds and mammals to leave it for that period.

Colobus, Blue Monkey and leopard were the only animals of which we had evidence, the former we actually saw.

Birds were so scarce that I only observed four species during the three days we spent on the volcano, viz. *Corvultur albicollis*, *Pseudoalcippe stierlingi*, *Batis mixta* and a coot which was swimming on the crater lake. No birds were shot as generally they would have fallen from fifty to a hundred feet and been hopelessly lost among the vegetation.

The only reptiles seen were the diminutive chameleon, *Brookesia platyceps*, which appeared to be tolerably common.

In addition to the topotypes mentioned above we took a single specimen of *Arthroleptis adolfi-friederici*. The commonest amphibia were *Nectophrynoides viripara* and *Hyperolius marginatus* Peters; since my return, what I should call *marginatus*, has been twice redescribed under the names of *H. pictus* and *H. ngoriensis*, Dr. Ahl giving "Ngori" Crater Lake as type locality for both, the former is based on adults and the latter on the young! We failed to find caecilians, though the situation seemed to be ideal and they should be present.

It was 3 p.m. on the day of our arrival before we got the lip of the crater sufficiently levelled off to be able to pitch, or rather sling, two tents between cables affixed to trees growing up from the precipitous sides of the crater. No collecting was attempted the first day, but we set out when the rain stopped at 9 the following morning and secured forty frogs in four and three-quarter hours, being subjected to frequent heavy showers. The next day we left camp at 8.30 a.m. and returned at 3.30 p.m., drenched to the skin after an hour's scramble up from the crater lake in pouring rain. During the dry season it is possible that meteorological conditions are very different and more propitious for collecting.

Nkuka Forest, Rungwe Mountains, Rungwe District. Alt. 5,460 feet.

Though all labels from this camp read "Rungwe Mtn." the actual site of the camp was on that occupied by Mr. R. E. Boulton of the American Museum Expedition and was in the Nkuka Forest just above the Nkuka River close beside the trail used by the lumbermen employed by the Rungwe Mission. Dr. Fülleborn stayed at the Mission which was scarcely three miles from the camp, Ahl cites Rungwe or Rugwe (sic) for the material which he collected.

Camped from March 24th to April 17th, 1930.

We scarcely saw the sun during the whole of the first fortnight of our stay. Rain fell in torrents at any hour of the day and during most of the night. One night the rain gauge at the mission station (below and outside the forest) having been emptied at sunset was found overflowing the next morning, i. e. a fall of *over* 125 mm. (5 inches) in one night. On April 2nd-3rd it rained for 26 hours without stopping. Naturally such conditions militated against the best collecting, setting rat-traps was useless and by day birds were so scarce that I have walked for two hours without getting a single specimen.

With the new moon, about April 6th, a change took place and though, with one exception, rain fell daily thereafter, it came chiefly between noon and 4 p.m. leaving the mornings clear and sunny. With the changed conditions native children began bringing up frogs from the region of cultivation half-an-hour's walk down the mountain (these were labelled Ilolo) but they showed little ability or energy in attempting to secure any but the most common and obvious creatures.

The forest itself is magnificent, the trees in large areas attain a great height and support masses of ferns, moss and lianas of various species. In ravines the tree ferns predominate and reach a height of twelve feet. Wild bananas are more abundant than in any other East African forest with which I am familiar. Where the trees are very tall the undergrowth is of the thicket type and often impenetrable in places; in areas where the trees are smaller, the forest floor is largely covered with grass and plants including many stinging nettles. About 2,000 feet above the camp, one enters the bamboo belt where these plants predominate.

Mammals are by no means common with the exception of colobus, blue monkey and blue duiker; leopards, squirrels and moles are not rare but elephant shrews were decidedly so in this part of the forest. Though no bats were collected at least six species were seen but they flew about the tops of the trees and seldom came so low as to be within striking distance of a net. Twenty years ago elephant and buffalo were to be found in this forest but have long since disappeared. One pit for elephant is still to be seen near the summit of the mountain and I have talked with a native who remembers having seen elephant on Rungwe.

As compared with the Uluguru Mountains, birds were scarce except for a few dominant species of bulbul, flycatcher and crested hornbills, the strident cries of the latter might be heard at most hours of the day. Four undescribed races were collected and for two of these — forms of *Illadopsis stictigula* and *Linurgus kilimensis* — the Nkuka Forest becomes type locality.

Reptiles were scarce; with the exception of *Crotaphopeltis h. tornieri*, the only other snakes found in the forest were *Natrix olivaceus* and *Chlorophis hoplogaster*. Not a lizard was found in the forest but *Lygodactylus angularis* and three species of chameleons, one of which was new, occurred at the forest edge and some of the chameleons undoubtedly might be found in glades where there was sufficient sunlight.

Bufo r. regularis actually occurred in clearings near the lower edge of the

forest. *Nectophrynoides vivipara*, for which Rungwe is part type locality, having been collected there by Fülleborn, is almost restricted to the bamboo belt at a high altitude; at first I was inclined to think that it was the commonest amphibian in the forest but with the change in climate we discovered that the lower forest swarmed with *Arthroleptis schubotzi* and to a less extent with *A. reichei*. *A. whytii* lives at the forest edge as does *Rana f. angolensis* though several of the latter were taken in deep forest. *Leptopelis vermiculatus* of the Usambara Mountains was taken. An undescribed race of *Probreviceps macrodactylus* of the Usambara Mountains completes the list of amphibia. With all their abundance not a single wild banana plant was found harboring a frog; this was certainly remarkable.

Igale, Poroto Mountains, Rungwe District. Alt. 6,000 feet.

Camp was made beside the road a little over a mile on the Mbeya side of Igale Pass, Tukuyu to Abercorn road.

Camped from April 24th to May 1st, 1930.

We arrived at 6.30 p.m. in driving rain and pitched tents by lantern light in a high wind; the rain continued until 10 a.m. the following day. The 25th was fine, practically rainless but on the 26th it rained from dawn till sunset, the fine rain driving before a blustering gale that made one think of the seashore. Unfortunately, having arrived in the dark, we had chosen a somewhat exposed position.

The country is rather difficult to describe, consisting as it does of steep hillsides, the tops are crowned with more or less short grass which increases in height as one descends until in the valleys the rank growth of grass and sedges is well above one's head. In the ravines the vegetation was not dissimilar to that growing in the vicinity of Morogoro and included a large number of acacia trees. Near the camp was a patch of rain forest not a hundred cubic yards in extent but a rendezvous for many birds. It was on the outskirts of this patch that most of the ornithological collecting was done. A few miles back towards Tukuyu there was abundance of forest but somewhat dry and not very interesting, it was here that squirrels were encountered. Streams occur along the bottoms of the principal valley and otters visited them for the sake of the freshwater crabs.

We concentrated on bird collecting as Unyika or the Nyika Plateau is type locality for many southern forms. New races of *Bessornis albigularis* and *Zosterops virens* resulted from this work, both coming from the nearby forest alluded to above.

Two reptiles were exceedingly abundant, the Striped Schaapsteker (*Trimororhinus t. tritaeniatatus*) and the Variable Skink (*Mabuya v. varia*); apart from these two forms, reptiles were decidedly scarce. I was greatly puzzled by the scarcity of chameleons in this part of the Porotos when they were so numerous at Nyamwanga and in the vicinity of Ngosi Volcano. The shrubs and other vegetation adjacent to the forest were not dissimilar. One can only postulate that the climate is too wet and cold for the development of their eggs which

would not affect ovoviviparous species like the Variable Skink; yet this seems scarcely likely to be the only explanation.

Nyamkolo, Lake Tanganyika, Northern Rhodesia. Alt. 2,700 feet.

Nyamkolo has been variously spelt as Niomkolo, Kinyamkolo, and Kinyamkole. The prefix "Ki" is an augmentative in the local dialect in direct contrast to its use as a diminutive in Swahili. I learned this from Mr. White, a veteran missionary of the London Missionary Society, who told me that Moore had stayed at Nyamkolo the year previous to his own arrival.

Camped from May 7th to 11th, 1931.

The rains had ended in March and the country round about was already dry and dusty.

My tent was pitched on the edge of a rocky bluff a hundred feet above, and two hundred yards from the lakeshore. In the immediate vicinity was arid scrub composed of stunted trees; the very large village was a hundred yards behind. Below the bluff were semi-swamped grasslands and some acres of grass and sedge standing in water. Over the swamped grass dragonflies of many species darted and hovered; nearly a hundred were netted in an hour. Further out in the acacias and sedges weaver birds clung to their nests for some were still building though other nests held young. A great bank comprised entirely of shells extended as a breakwater for half a mile or more around the bay in whose waters crocodiles might be seen swimming lazily in the early morning.

We had come to *Nyamkolo* because it was the type locality of a frog *Arthroleptis moorii* only known from a holotype collected by Moore in 1901; we only found it on the second day among the still verdant grass of a cattle pasture near the lakeshore. The taking of *Hyperolius rhodoscelis*, *H. granulatus*, and *Phrynobatrachus perpalmaris* all of which were described from Lake Mweru, due west of Nyamkolo, was of considerable interest. The toads also, which I am calling *Bufo r. regularis* seem to be intermediate with *B. lemairii* though I regard the latter as distinct. The only other species taken were *H. callichromus*, *R. occipitalis* and *R. m. mascareniensis*.

Kasanga, Lake Tanganyika, Namanyere District, Urungu. Alt. 2,700 feet.

Kasanga is the original native name of Bismarckburg and lies on a flat river delta at the southeastern end of the lake a little north of the border between Tanganyika and Northern Rhodesia.

A few hours on May 13th, camped from May 16th to 17th, 1930.

Dry season.

Three hours were spent collecting porters for the journey to Kitungulu when we arrived on the morning of May 13th. On our return we reached Kasanga after midday on the 16th. The same afternoon I set out for the rocks in search of the aquatic cobra and both morning and afternoon of the 17th in a boat after the same quarry.

The promontories bounding Kasanga Bay to the north and south are composed chiefly of masses of rock, while a very short distance behind the town rises a semicircle of stone-strewn hills which are densely clothed with scrub and close-set dry forest. The town itself is very well provided with palms and mango trees and its vegetation is generally similar to what one finds at any sea-level coastal town such as Dar es Salaam.

The bay was delightful, many gorgeously coloured little fish could be seen swimming in the clear waters adjacent to the rocky headlands. It is doubtless due to the abundance of fish that the water cobra — *Boulengerina a. stormsi* — is so common.

Salimu attempted to secure *Procavia munzneri* which we had seen on the rocky shore south of the town as we rowed up the coast; the species was described from Kasanga. Though he failed to get it he procured an interesting squirrel — *Paraxerus cepapi quatus*.

Kitungulu, Namanyere District, Urungu. Alt. circa 4,000 feet.

Kitungulu is in the hills east of Kasanga. Despite the "Ki" the village is composed of less than a dozen huts. Ntungulu lies still further east of Ki(n)-tungulu. It is on the old German road from Kasanga to Tukuyu which has fallen into disuse and likely to remain so as being unsuitable for motor traffic. Though only twelve miles from Kasanga it is a good five hours march over a stony track that appears to be something of a nightmare to the local porters and I was informed that all able-bodied men were leaving Kasanga because they disliked portage.

Camped from May 14th to 15th, 1930 without tentage.

Dry season.

Kitungulu is the type locality for *Typhlops gracilis* collected here about 1909-1910 by Capt. Fromm and Herr Hauptmann who made a prolonged stay in the neighbourhood while collecting birds. I visited their old camp site and every conceivable place where the blind snake might be found but though, without any help from the local natives, we secured eleven snakes of eight species we failed to get this interesting reptile.

At Kitungulu there is a patch of rain forest bordering the river, little is left of it for it is no longer being preserved as in German times and the natives are felling and burning it. We searched among the rotting trunks of felled and half burnt trees whose dead leaves still strewed the ground and among which great numbers of *Arthroleptis xenodactylus* were found, the larger *A. s. stenodactylus* was in the dry forest.

Adjacent to this relic of virgin forest was very dry orchard forest similar in type to that at Saranda on the Central Railway, the soil was also of the same red and stony nature so that two entirely different faunas were existing in close proximity.

Leopards were heard at night and a blue duiker was seen one day; a shrew that was taken in a midden proved to be a new race of *Suncus varilla*.

A flock of gray parrots was seen at close quarters and only took to flight

as Salimu was stalking them. *Coracias s. spatulatus* and *Lybius l. macclounii* were perhaps the most interesting of the birds collected.

An undescribed *Bufo* was found in dry forest in the vicinity of the primary forest, where it was more abundant.

Kipili, Lake Tanganyika, Namanyere District, Urungu. Alt. 2,700 feet.

A port of call of the lake steamers on the east shore of the lake.

May 19th, 1930.

Dry season.

A jetty is built out from the low-lying sandy bay. At the time of our visit the hills, which rise from the bay, were clothed in rank dry grass among which were stunted trees.

Some guineafowl (*Numida m. rikwae*) and reptiles, including a new race of agama lizard, were collected. Frogs were found in stagnant pools of water in the native gardens where castor oil plants and mango trees were much in evidence. Opposite to Kipili across the bay is a rocky shore where otters and water cobras are to be found.

Sumbwa, Lake Tanganyika, Ufipa. Alt. 2,700 feet.

A port of call of the lake steamers on the east shore of the lake.

May 20th, 1930.

Dry season.

Three or four hours were spent ashore at this port; there are only two native huts by the jetty which had been pounded to bits by the strong waves. The reason for the steamer calling at this desolate spot is to collect produce brought down from a densely populated area some seven miles away.

To the north a beautiful, though narrow, strip of sandy beach stretches for many miles. Shells were abundant along this beach and sand-colored tiger beetles rose in clouds or ran ahead of one along the shore. On the far side of the beach, fifty feet from the water's edge, are deep and impassable swamps reaching to the sluggish river which, concealed by dense beds of sedge, acacia bushes and other vegetation, empties itself to the right of the jetty.

A freshly deceased example of a scarce snake (*Glypholycus bicolor*) was found upon the beach; it is of aquatic habits and is known only from Lake Tanganyika. The finding of a little frog (*Phrynobatrachus perpalmatus*) in the swamp constituted the first record of its occurrence in Tanganyika Territory.

Ujiji, Lake Tanganyika, Kigoma District. Alt. 2,800 feet.

Ujiji (Udjiji), the famous old Arab settlement on the east coast of the lake, is five miles south of Kigoma, the terminus of the Central Railway which connects the lake with Dar es Salaam on the coast.

Camped from May 22nd to 29th, 1930.

Dry season.

Ujiji looks very attractive in the distance for it is well supplied with mango trees which offer a grateful shade after the open and treeless country round about. Unfortunately, however, the many marshes in the vicinity and lying between Ujiji and the lake, breed hordes of mosquitoes and gnats which render life unpleasant by biting day and night. At this season of the year Ujiji is not a good collecting centre though probably excellent at the breaking of the rains. Visits were made down the coast to the Luiche (Luitsche) River and north to the Bangwe headland, where quantities of the freshwater medusa (*Limnocolida tanganyicae*) were seen.

Search was made for the Slender-snouted Crocodile (*Crocodylus cataphractus*) which has been reported from Ujiji but more probably came from the Luiche River. The species appears to be well-known to the fishermen but on reaching the river, up which we paddled for a great distance, we found it still in flood, overflowing its banks and inundating acres of surrounding country, as a result of the unprecedented rains of 1930. A skull of this crocodile was seen in the Provincial Commissioner's house. Nile Crocodiles were plentiful though very wary.

Ujiji is type locality for *Amphisbaena phylofiniens* Tornier; we were unsuccessful in locating any but secured a pair of another interesting rain-forest form, *Typhlops graueri*, heretofore only known from the type which came from the forested region northwest of the lake. *Lygodactylus picturatus gutturalis* is a western race which was unknown from east of the lakes but is abundant at Ujiji; in all probability having been introduced in loads of produce when there was so much traffic with the Congo in the days of the slavers.

Shinyanga, Shinyanga District, Usukuma. Alt. 3,669 feet.

Shinyanga is 123 miles north of Tabora on the Tabora to Mwanza branch line of the Central Railway.

I was the guest of the late Mr. J. B. Charlesworth from June 2nd to 4th, 1930.

The annual rainfall is about thirty inches and occurs between October and April, November being the wettest month. At the time of my arrival, Shinyanga had already experienced two months of drought and the countryside was bone-dry with the exception of a few shrinking pools here and there.

Bird life is rich and varied, particularly among the scattered baobabs a few miles out on the Ibadikuli road where a great variety of eagles and hawks were seen. The whistling cries of the small love birds (*Agapornis fischeri*) are quite prominent among the sounds of the bush.

The stop-over in Shinyanga was made with the object of meeting Mr. J. B. Charlesworth. No snakes were seen, and the only abundant reptiles were *Pachydactylus boulengeri* and *Agama agama mwanzae* which occur on the rocks a few miles southeast of the station. Amphibia were naturally not much in evidence at such a season and few were collected beside the pre-

sumably aestivating *Chiromantis p. petersi* found in a crow's nest on the top of a baobab.

Mwanza, Mwanza District, Usukuma. Alt. 3,800 feet.

Mwanza on the south or southeast shore of Lake Victoria.

Camped from June 5th to 9th and July 21st to 22nd, 1930.

It was said to be a couple of months since rain had fallen but at least one heavy shower fell each day, or at night, during the two week-ends of our stay.

Little collecting was done as my time was taken up with packing and consigning collections to the coast and making arrangements for further *safari*. I only made one excursion — of some three hours duration — during which time with thirty-three shots I secured thirty specimens, mostly mammals, *Coleura afra* and topotypes of *Procavia matschie* and *Heterohyrax brucei victorianjansae*. Topotypes of *Tatera vicina muansae*, *Mastomys microdon victoriae* and *Arvicanthus abyssinicus muansae* were also preserved.

Perhaps the most astonishing thing is the boldness of the hyrax; elsewhere one is accustomed to seeing these timid creatures disappear into their rocky fortresses while one is still far away. Near Mwanza they may be seen in great abundance placidly sitting within easy gunshot or occasionally one will actually climb from its cranny to the top of a boulder in order to get a better view of the visitor.

Mwanza is rich in bird life, the calling of Sea Eagles over the township is a matter of daily occurrence, cormorants ornament every little jutting rock while Hadadah Ibis and Egyptian Geese plod about in the marshes quite close to the main road.

Ukerewe Island, southeastern Victoria Nyanza. Alt. 3,800 feet.

Camp was made at Murutunguru where there is a long-established Roman Catholic Mission known as Marienhof.

Camped from June 10th to 20th, 1930.

Dry season. No rain had fallen for some time prior to our arrival and none during our stay. The heat, very pronounced in sheltered spots, was tempered elsewhere by breezes from the lake; towards midday these became so violent as to raise clouds of dust which was in due course deposited over all one's possessions.

The level of the lake varies from year to year and in authoritative works is variously stated to be 3,720, 3,780 and 3,800 feet; the island rises from a hundred to two hundred feet above the lake. Dr. Bailey Willis has suggested that about fifty miles of solid crystalline rocks lie below the lake and that great heat has forced up the less solid margins so that the lake is comparable to a shallow saucer. The island is only separated from the mainland by a narrow channel, so that a lion was able to swim it early in 1930, and was still resident on the island at the time of my visit.

From Mwanza one crosses the entrance to Speke Gulf by a steam tug and lands at Nansyo, the port on Ukerewe. The journey takes from five to six hours. From Nansyo it is ten miles to Murutunguru; I was driven over by an Indian owning the only lorry on the island, a fact of which he was fully cognisant and kept reminding me. I returned to Nansyo on foot while the loads were brought on three ox-carts hired from the mission; porters are almost unobtainable as the people do not like such work and are sufficiently affluent as to be independent.

The reason for selecting Murutunguru was partly for its central location, but chiefly because Père A. Conrads is still resident there. Père Conrads is an entomologist with a general interest in zoölogy, and I had come to the island in search of topotypic material of several forms discovered by him. We were successful in getting *Hystrix galeata conradsii* and *Coliuspasser macrourus conradsii* but failed in finding *Calogale conradsii*, *Rhinoptilus cinctus emini* and *Atractaspis conradsii*.

The abundance of carnivora on the island is one of its interesting features, doubtless this accounts for the shyness of the game birds. There is an abundance of bird life upon the island. Reptiles were also plentiful but, for the most part, of common and widely distributed species. Amphibia were scarce at the time of our visit.

We owed much to the kindly interest of Père Conrads who did everything possible to ensure the success of our work and showed me much hospitality. The Wakerewe, doubtless due to the long training of Père Conrads, were most helpful in bringing in specimens, though as only a small proportion speak Swahili, we had some difficulty in making known what we did *not* want.

Bukoba, southwestern shore of Victoria Nyanza. Alt. 3,800 feet.

Three hours (9 to 12 a.m.) were spent ashore while the S. S. *Usoga* was in harbor.

The morning was very overcast and threatening and remained so for the first two hours until the sun came out.

The town is rather pleasantly situated in a semicircle of rock-strewn hills with a sandy shore in the centre of the bay, reed-grown swamps and rocky promontories beyond. The rank growth of grass and weeds rendered collecting in the waste lands difficult so presently we wandered to the native-owned coffee plantations and here encountered a wealth of small bird life. Sixteen birds were shot including a topotype of *Pogonirulus leucolaema nyansae*.

Entebbe, north shore of Victoria Nyanza, Uganda. Alt. 3,800 feet.

Camped from June 26th to 29th, 1930.

According to native reports, no rain had fallen for two months until the day before our landing, when it had rained in torrents. Thunder showers occurred about noon on the 27th and 28th and a tropical downpour, lasting several hours, on Sunday 29th, but too late to affect collecting as we left shortly after sun-up on the 30th.

The Botanical Gardens remind one of Amani and everywhere are acres of well-swept lawns. The grass along the lake shore is kept cut and all the drain furrows have close-cropped banks of green instead of being shaded by the rank growth of grass beloved by frogs; furthermore these furrows are flushed with a strong disinfectant, and as if to render Entebbe still more distasteful to amphibians, the marshes and swamps are generously oiled as a measure of mosquito larvae destruction.

Mabira Forest, near Jinja, Uganda. Alt. circa 4,000 feet.

Spent the day collecting on July 1st, 1930.

Though it was the dry season when we visited Mabira Forest, the weather had been erratic and several showers had fallen during the past few weeks, still the forest was very dry.

The forest is of vast extent covering some 150 square miles and it should be borne in mind that my impression is based only on a couple of square miles in the vicinity of the rubber and coffee plantation which was started by the late Dr. Cuthbert Christy, the discoverer of *Leptopelis christyi* and *Hylambates verrucosus*, both of which were described from the Mabira Forest, Chagwe. It was on the off-chance of procuring one or both of these desiderata that the forest was visited.

The trees are very tall and fine, but progress among them is impossible over large areas on account of the dense undergrowth intermingled with sword grass. I was driven some three miles through the forest to a more open section where one could get about with tolerable ease. Here the forest floor was leaf-strewn, rotten logs and stumps with both moist and dry interiors were plentiful and everything seemed ideal for reptile life, but in two hours four Europeans and a native found nothing but some tree mice (*Hylomyscus stella kaimosae*) and saw a squirrel.

THE PROBLEM OF EAST AFRICA'S MOUNTAIN FOREST FAUNA

To return to the primary object of the trip, viz. the composition of the vertebrate fauna of these mountains in relation to that of the Uluguru range. As is well known, the plains and savannah fauna of East Africa up to about 5,000 feet is comprised for the most part of forms common to South Africa or widely distributed outside of the forest areas throughout the continent south of the Sahara desert barrier.

So long ago as 1896 it was pointed out by the late Professor J. W. Gregory that the botanical and zoölogical life of the higher mountains in this region showed closer affinities with their respective groups in West Africa than with the plains fauna and flora in their own immediate vicinity. Today these widely scattered mountains are like

so many islands, their higher slopes clothed in rain forest, which supports a fauna that is presumably unable to exist under the climatic and topographical conditions found in the intervening areas. In the case of birds it is easy to postulate flight as the method of distribution and the seeds of plants may have been disseminated in some instances through avian agency but it is a problem of no small biological interest to visualize earlier conditions through a study of the distribution of the amphibians, reptiles and mammals.

As an interesting example one might cite the arboreal lizard, *Lacerta jacksoni*, which occurs on the Kivu Volcanoes, Mt. Ruwenzori, Mt. Elgon, Mt. Gargues, Mt. Kenya, Mt. Kilimanjaro and the Usambara range but is absent from the intervening areas except at high altitudes where rain forest occurs. The sluggish, heavy bodied Gaboon Viper, *Bitis gabonica*, for long known only from the West Coast has been found in Uganda forests and in comparatively recent times was discovered in the forested regions of the Usambara Mountains within sixty miles of the Indian Ocean.

Gregory has shown that as the glaciers recede up Mt. Kenya the rain forest follows; naturally the process is a very slow one and the area of forest does not increase by reason of the constant assault by natives on the forest fringe at lower levels where they fell and burn its component trees, coveting the rich soil for raising crops. This encroaching on the forest has been proceeding for centuries and early explorers such as Mackay and Johnston speak of the remains of great forest trees on lower ground now covered by scrub or bush. It is noteworthy that the exploited and abandoned garden areas never revert to forest but produce a secondary growth of scrub and thorn which is far harder to clear than the original forest as it contains many fire-resistant types and its denser thickets are impervious to annual burning.

After a few seasons the soil of the cleared areas, exposed to the rays of a tropical sun, becomes friable and the rich soil is washed away by the heavy rainstorms; gravel and stones are left behind. The rushing floods, no longer conserved by roots and leaf mould, tear down the hillsides cutting gulleys as they go: the damage done has to be seen to be appreciated. In the Ubena Highlands it was no uncommon experience to find roads abruptly terminating in a twenty-foot drop as a result of the rush of water down them. In course of time a lessened rainfall appears to go hand in hand with the destruction of virgin forest and is considered by many to account for the indisputable desiccation of large areas in Tropical Africa. The relic

faunae of Mpwapwa and Ujiji, struggling for survival today, undoubtedly points to the fact that these regions were covered with forest in the past. At the present time, large mobs of cattle, unduly multiplied under European protection, raise clouds of dust as they wander through the thorn-bush areas of Mpwapwa in search of pasturage.

In Nyasaland, which has been longer under observation than Tanganyika, it has been computed that the impoverished land will only support half the population that it did a hundred years ago. Dr. Robert Laws, resident for half a century in the country, recently stated in evidence before the Nyasaland Lands Commission, that so recently as fifty years ago, northern sections of the country were well wooded and supplied with perennial streams. He mentioned twenty large streams which had ceased to flow in the Mombera country today but which formerly flowed all the year round prior to the wholesale destruction of the forests which had rendered the region uninhabitable. I mention this to invite attention to the imperative need for conservation of the forests. The fauna, with the exception of a few adaptable species, perishes with the forest. Officers of the Forestry Service in Tanganyika are keenly alive to the desirability of preserving the remaining forest areas but under the last administration District Officers were loth to prosecute natives for destroying forest reserves; even though the offenders were caught *flagrante delicto* by the forest guards.

From a cursory review of the distribution of the species in these mountains, it seemed likely that the oldest group of terrestrial vertebrates, *viz.* the Amphibia, slow of movement and restricted in migration, would throw most light on the problem; next the reptiles, then the mammals and lastly the birds which, by reason of their ability to fly, are less likely to furnish useful data.

Before proceeding further to discuss the conclusions, it would be well to present the data on which they are based. In compiling the following lists, *drastic elimination of all species which are not almost entirely dependent on the rain forest has been necessary*, for the inclusion of mountain-valley and high-plateau forms not only would swell the lists to two or three times their present size, but would give rise to complications, as so many of these types extend their range to the savannah.

*Amphibian Fauna Associated with
Mountain Rain Forest*

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga & Ubena Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Boulengerula boulengeri</i>	L					
<i>Boulengerula uluguruensis</i>		L				
<i>Scolecocomorphus vittatus</i>	L	L				
<i>Scolecocomorphus uluguruensis</i>		L				
<i>Scolecocomorphus attenuatus</i>		L				
<i>Scolecocomorphus kirki</i>				L		
<i>Bufo brauni</i>	L	L				
<i>Bufo micranotis</i>		L				
<i>Bufo taitanus uzunguensis</i>			L	L		L
<i>Nectophrynoides tornieri</i>	L	L				
<i>Nectophrynoides vivipara</i>		L	L	T	L	L
<i>Phrynobatrachus krefftii</i>	L					
<i>Arthroleptis stenodactylus uluguruensis</i> ..	L	L				
<i>Arthroleptis adolfi-friederici</i>	L	L				L
<i>Arthroleptis reichei</i>			L	L	L	L
<i>Arthroleptis schubotzi</i>			L	L	L	
<i>Arthroleptis xenodactylus</i>	L	L				
<i>Arthroleptides martiensseni</i>	L	L				
* <i>Leptopelis rufus</i>	T	L				
* <i>Leptopelis aubryi</i>	L					
<i>Leptopelis vermiculatus</i>	L		N		L	
<i>Leptopelis uluguruensis</i> (inc. <i>tanganus</i>)...	A	L				
<i>Leptopelis parkeri</i>		L				
<i>Callulina krefftii</i>	L	L				
<i>Probreviceps macrodactylus macrodactylus</i>	L					
<i>Probreviceps macrodactylus loveridgei</i> ...		L				
<i>Probreviceps macrodactylus rungwenensis</i> ...					L	
<i>Probreviceps uluguruensis</i>		L				
<i>Spelaeophryne methneri</i>		L				
<i>Parhoplophryne usambaricus</i>	L					
<i>Hoplophryne rogersi</i>	L					
<i>Hoplophryne uluguruensis</i>		L				
TOTAL.....	17	20	5	5	5	4

* Common to the Cameroon Mountains.

A = Recorded by Ahl.

L = Collected by Loveridge.

N = Recorded by Nieden.

T = Recorded by Tornier.

A consideration of the foregoing shows that the affinities of the Uluguru fauna are intimately associated with those of the Usambara range to the north but have comparatively little in common with those of the southwestern highlands, only four species (or 13% for one of these has broken up into races) being found in both. Two species of the genus *Leptopelis* occurring in the Usambara, range across the Central African rain forests to the Cameroon Mountains on the west coast. One might be inclined to question the specific identity of these eastern and western frogs were it not that their distribution is paralleled by several reptiles such as *Bitis gabonica*, *Lygodactylus fischeri* and *Holaspis guentheri*, therefore there seems no valid reason for proposing fresh names for East African *Leptopelis rufus* and *aubryi* as has recently been done.

The caecilian genera *Boulengerula* and *Scolecophorus* (with which *Bdellophis* has been united) presumably originated in extreme East Africa as neither genus has Central or West African representatives so far as is known. The only caecilian genus common to both East and West is *Dermophis*, represented in Kenya Colony by *gregorii* of Ngatana and in the west by *thomensis* of St. Thomas Island in the Gulf of Guinea. So strange is this interrupted dispersal that one wonders if the genus is a natural one.

No toads associated with the East African rain forest are common to the West Coast though they have their counterparts both in species and genera, for the viviparous tree toads (*Nectophrynoides*) of the east are represented by the oviparous tree toads (*Nectophryne*) of the west.

Phrynobatrachus is a widely distributed genus with numerous savannah-dwelling forms, but *P. krefftii* of the Usambara Mountains and its relatives from the Central African Lake Region — *P. graueri*, *P. petropedetoides*, *P. versicolor* seem to be associated with pools in, or at the edge of, virgin forest. While the fauna of the Kivu Volcano region and adjacent primary forests are principally western in type they do possess an admixture of eastern forms as illustrated by the genus *Arthroleptis* for *A. adolfi-friederici* and *reichei* occur there but so far as is known do not extend their ranges further to the west.

The amphibia of Rungwe have more in common with the fauna of the Kivu Volcanoes than with the Usambara Mountains and one may justifiably postulate connection by virgin or gallery forest down the eastern shores of Lake Tanganyika where traces of a vanishing forest fauna still persist at Ujiji (*Typhlops graueri*) and Kitungulu (*Typhlops gracilis*, *Arthroleptis xenodactylus*, etc.).

The five Brevicipitid genera — Callulina, Probreviceps, Spelaeophryne, Parhoplophryne and Hoplophryne — are, with the exception of one race on Rungwe, known only from the Usambara and Uluguru Mountains as far as the area under discussion is concerned. Spelaeophryne was described from Kilwa and possibly may not be a true rain-forest species. While Probreviceps may be derived from Breviceps of South Africa, the ancestry of Parhoplophryne and Hoplophryne is obscure, a separate subfamily (Hoplophryninae) has been created for their reception by Noble.

<i>Reptilian Fauna Associated with Mountain Rain Forest</i>	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga & Ubena Mtns.	Rungwe Mtn.	Poroto Mtns.
Typhlops kleebergi	W					
Typhlops uluguruensis		L				
Typhlops punctatus gierrai	L	L				
Natrix olivaceus (mountain type)	L	L			L	
Lycophidion meleagris	L	L				
Prosymna ornatissima		L				
Geodipsas vauerocegae	L	L				
Geodipsas procterae		L				
Crotaphopeltis hotamboeia tornieri	L	L	L	L	L	
Crotaphopeltis werneri	W					
*Miodon gabonensis					L	
Aparallactus werneri	L	L				
Aparallactus uluguruensis	L	L				
*Elapsoidea guentheri (nigra type)	L	L				
Causus defilippii	L	L			N	
*Bitis gabonica	L					
*Atheris ceratophorus	L					
Atheris barbouri			L	L		
Paragonatodes africanus	L	L				
*Lygodactylus fischeri	L	L				
Lygodactylus angularis				L	L	
Lacerta jacksoni	L					
*Holaspis guentheri	L	?				

* Common to West Africa.

L = Collected by Loveridge.

N = Recorded by Nieden.

W = Recorded by Werner.

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga & Uluenda Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Mabuya comorensis</i>	L	L				
<i>Siaphos kilimensis</i>	L	L				
<i>Scelotes eggeli</i>	L					
<i>Scelotes uluguruensis</i>		L				
<i>Scelotes tetradactyla</i>		L				
<i>Melanoseps ater</i>	L	L	L			
<i>Chamaeleon goetzei</i>			L	L	L	L
<i>Chamaeleon tempeli</i>			L	L		
<i>Chamaeleon fischeri matschiei</i>	L	L				
<i>Chamaeleon fischeri multituberculatus</i> ...	L					
<i>Chamaeleon deremensis</i>	L	L				
<i>Chamaeleon fülleborni</i>						L
<i>Chamaeleon werneri werneri</i>			L			
<i>Chamaeleon werneri dabagae</i>			L			
<i>Chamaeleon incornutus</i>				L	L	L
<i>Chamaeleon laterispinis</i>			L			
<i>Chamaeleon melleri</i>	L	L				
<i>Chamaeleon tenuis</i>	L					
<i>Chamaeleon spinosus</i>	L					
<i>Brookesia temporalis</i>	L					
<i>Brookesia brevicaudatus</i>	L	L				
<i>Brookesia platyceps</i>				L	L	L
TOTAL.....	29	24	8	7	8	4

L = Collected by Loveridge.

The reptiles give further conclusive evidence as to the distinctness of the Usambara-Uluguru fauna from that of the southwestern highlands. The paucity of both amphibian and reptilian life in the temperate rain forest of the southwestern highlands as compared with that of the tropical rain forest is very striking. It should be borne in mind, however, that one and a half months were spent in both the Usambara and Uluguru ranges as against a month each in the Uzungwe, Ukinga and Rungwe Mountains and only a fortnight in the Porotos.

Actually only two species of snakes are common to both the Uluguru and southwestern highlands and each of these has a closely related

and widespread lowland relative. *Natrix olivaceus* is dwarfed in the colder climate of the rain forest and *Crotaphopeltis hotamboeia tornieri* has a reduced number of scalerows as compared with the savannah race; it may be that these two forms are later adaptations to forest life at high altitudes recently developed from the widespread savannah stock and not an integral part of the supposedly primitive forest-dwelling fauna. What is true of *Natrix* and *Crotaphopeltis* as to their having lowland relatives applies to most of the other ophidian genera associated with the rain forest; only two, or at most three, genera (*Geodipsas*, *Miodon* and *Atheris*) are exclusively forest-dwelling as regards all their species. One of these — *Geodipsas* — is possibly an unnatural assemblage of forms as it embraces Malagasy and mainland species, the only other colubrine genus with a similar distribution being the ancient and widespread *Natrix*. When we come to consider the species we find that only four (or 22%) are common to the forested regions of East and West Africa while no fewer than eleven species (or 61%) are endemic and nine (50%) of these are known only from the Uluguru and Usambara Mountains.

Of the lizards, only one, a burrowing type, is common to both Uluguru and southwestern highlands; this skink (*Melanoseps*) has been taken at a low altitude (Mkata Station) but in a surviving belt of gallery forest on the banks of a permanent river which suggests a possible means of later dispersal. Two species (or 18%) are common to West Africa; half-a-dozen are only known from African forests east of, and including, Ruwenzori; two (or 18%) are confined to the Uluguru and Usambara ranges, these endemic forms are skinks of the genus *Scelotes* which burrow in the rich leaf mould and the debris of decaying trees.

The slow-moving chameleons have been particularly susceptible to speciation and no form is common to the Uluguru and the southern highlands. In addition it might be remarked that all sixteen forms (or 100%) are confined to East Africa, none being known from the West coast, furthermore eight (or 50%) are restricted to the Uluguru-Usambara and associated mountains and eight to the southern and southwestern highlands. In the case of chameleons it has not been possible to adhere so strictly to a division as between forest and non-forest forms for in life few of these reptiles actually live in forest glades but are most abundant in the low trees and bush surrounding the forest; many live in the uplands quite independently of forests but none of those listed occur at low altitudes with the exception of *C. melleri*.

*Arifauna Associated with the
Mountain Rain Forest*

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Stephanoaëtus coronatus</i>	L		L		L	
<i>Buteo oreophilus</i>	L		L			
<i>Francolinus squamatus usambaricus</i>	L					
<i>Francolinus squamatus uzungwensis</i>			L			
<i>Sarothrura elegans languens</i>		L				
<i>Sarothrura rufa elizabethae</i>	?	L				
<i>Sarothrura</i> sp.....			L			
<i>Columba arquatrix arquatrix</i>	L	L	L		L	
<i>Turturoena delegorguei sharpei</i>	L	L				
<i>Turtur afer kilimensis</i>	L	L				
<i>Aplopelia larvata larvata</i>		L			L	
<i>Cerococcyx montanus patulus</i>	M	L				
<i>Turacus livingstonii cabanisi</i>		L	L			
<i>Turacus livingstonii livingstonii</i>				L	L	L
<i>Turacus fischeri</i>	L					
<i>Turacus hartlaubi</i>	L					
<i>Bycanistes buccinator</i>	L	L				
<i>Bycanistes cristatus brevis</i>	L	L	L	L	L	
<i>Apaloderma narina narina</i>		L				
<i>Heterotrogon vittatum vittatum</i>	L	L		L	L	
<i>Buccanodon leucotis kilimensis</i>	L	L				
<i>Buccanodon olivaceum olivaceum</i>	L	L		L	L	L
<i>Protodiscus insignis reichenowi</i>	L					
<i>Mesopicos griseocephalus kilimensis</i>		L				
<i>Mesopicos griseocephalus ruwenzori</i>			L			
<i>Smithornis capensis suahelicus</i>		L			?	
<i>Motacilla clara</i>	L	L		L	L	
<i>Illadopsis rufipennis distans</i>	L					
<i>Illadopsis stictigula stictigula</i>	L	L				
<i>Illadopsis stictigula pressa</i>			L	L	L	
<i>Pseudoalcippe abyssinicus abyssinicus</i>	L					
<i>Pseudoalcippe abyssinicus stierlingi</i>		L	L		L	L
<i>Suaheliornis kretschmeri kretschmeri</i>	L	S				
<i>Phyllastrephus terrestris suahelicus</i>		L				
<i>Phyllastrephus flavostriatus flavostriatus</i> ..	L	L				
<i>Phyllastrephus rabai</i>	L					
<i>Phyllastrephus fischeri placidus</i>		L	L		L	L
<i>Phyllastrephus cerviniventris</i>		L				

L = Collected by Loveridge.

M = Collected by Moreau.

S = Recorded by Sclater.

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Arizelocichla nigriceps percivali</i>	L					
<i>Arizelocichla nigriceps neumanni</i>		L				
<i>Arizelocichla nigriceps fusciceps</i>					L	L
<i>Arizelocichla tephrolaema usambarae</i>	L					
<i>Arizelocichla milanensis striifacies</i>	L	L	L		L	
<i>Arizelocichla masukensis roehli</i>	L	L				
<i>Arizelocichla masukensis masukensis</i>			L	L	L	
<i>Arizelocichla chlorigula</i>		S	L	L		
<i>Chlorocichla flaviventris centralis</i>	L	L				
<i>Andropadus insularis insularis</i>		L				
<i>Eurillas virens virens</i>	L	L			L	
<i>Alseonax adustus fülleborni</i>	L	L	L	L	L	
<i>Alseonax minimus roehli</i>	S					
<i>Dioptrornis fischeri amani</i>	M					
<i>Dioptrornis nyikensis</i>			L		L	L
<i>Batis mixta</i>	L	L	L	L	L	L
<i>Batis minor nyanzae</i>		L				
<i>Batis molitor soror</i>		L				
<i>Platystira peltata peltata</i>		L				L
<i>Trochocercus bivittatus</i>		L				
<i>Trochocercus albonotatus subcaeruleus</i>	L	L	L		L	L
<i>Turdus libyanus tropicalis</i>		L				
<i>Turdus olivaceus roehli</i>	L					
<i>Turdus olivaceus uluguru</i>		L				
<i>Turdus olivaceus nyikae</i>			L		L	S
<i>Turdus gurneyi usambarae</i>	S	L				
<i>Turdus gurneyi otomitra</i>				L		
<i>Cossypha heuglini intermedia</i>	L	L				
<i>Cossypha natalensis</i>	L	L				
<i>Cossypha caffra iolema</i>	L	L	L	L		L
<i>Bessornis albigularis albigularis</i>		L				
<i>Bessornis albigularis porotoensis</i>					L	L
<i>Sheppardia cyornithopsis bangsi</i>		L				
<i>Sheppardia cyornithopsis sharpei</i>					L	S
<i>Alethe fülleborni fülleborni</i>				L	L	
<i>Alethe fülleborni usambarae</i>	S	L				
<i>Alethe anomala montana</i>	S					
<i>Alethe macelounii</i>						S
<i>Pogonocichla stellata orientalis</i>	L	L				

L = Collected by Loveridge.

M = Collected by Moreau.

S = Recorded by Sclater.

	Usambara Mtns.	Uluguru Mtns.	Uzungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
<i>Pogonocichla stellata johnstoni</i>			L	L	L	L
<i>Seicercus ruficapilla minulla</i>	L	L				
<i>Seicercus ruficapilla johnstoni</i>					L	L
<i>Bradypterus usambarae</i>	S	L	L	L	L	L
<i>Apalis thoracica uluguru</i>		L				
<i>Apalis thoracica interjectiva</i>			L			
<i>Apalis thoracica murina</i>				L	L	L
<i>Apalis moreaui</i>	L					
<i>Apalis alticola</i>				L	L	
<i>Apalis flavida golzi</i>		L				
<i>Apalis flavida niassae</i>					S	
<i>Apalis chapini</i>		L	L			
<i>Altisornis ruficeps ruficeps</i>	S					
<i>Altisornis ruficeps altus</i>		L				
<i>Campephaga flava (incl. nigra & hartlaubi)</i>	L	L				
<i>Campephaga quiscalina munzneri</i>		L				
<i>Chlorophoneus rubiginosus munzneri</i>	L	L				
<i>Chlorophoneus nigrescens</i>	M					
<i>Chlorophoneus nigrifrons nigrifrons</i>	L	L				
<i>Chlorophoneus nigrifrons manningi</i>				L		L
<i>Chlorophoneus quadricolor intercedens</i>		L				
<i>Malaconotus alius</i>		L				
<i>Onychognathus walleri walleri</i>	L	L				
<i>Onychognathus walleri nyasae</i>			L	L	L	
<i>Onychognathus morio shelleyi</i>	L	L		L		
<i>Onychognathus tenuirostris</i>		L	L			
<i>Stilbopsar kenricki</i>	L	L				
<i>Zosterops virens usambarae</i>	L	L				
<i>Zosterops virens stierlingi</i>			L	L		
<i>Zosterops virens sarmenticia</i>					L	L
<i>Cinnyris mediocris usambarae</i>	L					
<i>Cinnyris mediocris fülleborni</i>			L	L	L	L
<i>Cinnyris loveridgei</i>		L				
<i>Spermophaga ruficapilla cana</i>	L					
<i>Cryptospiza reichenowi ocularius</i>		L	L	L		L
<i>Pirenestes minor minor and frommi</i>		L				
<i>Linurgus kilimensis kilimensis</i>		L				
<i>Linurgus kilimensis rungwensis</i>					L	L
TOTALS . . .	56	69	29	23	34	23

L = Collected by Loveridge.

M = Collected by Moreau.

S = Recorded by Slater.

In the case of the birds I have been able to augment the records of my own collecting by some communicated to me by Mr. R. E. Moreau and a dozen mentioned by Sclater in his *Systema Avium Aethiopicarum* which publication has been of the greatest assistance to me in the compilation of the above list. By the exclusion of most of the non-passerines and a great many upland species the list of birds collected in these mountains has been reduced to half.

An examination of the foregoing list shows that birds are more widely distributed than any other group of vertebrates considered, but that many species have been so long separated from their allies on other ranges that they have split up into well-defined races. If Kilimanjaro were included it would be seen that more than a dozen forms occur there which are represented by a different subspecies in the Usambara though over a score of forms are common to both Kilimanjaro and the Usambaras. Undoubtedly when more collecting has been done on the latter range the number of forest species will be in excess of those to be found on the Uluguru.

The futility of expecting much assistance from a study of the avifauna is exemplified by the fact that all except four (i. e. 93%) of the fifty-two genera listed above, are common to West Africa though not necessarily to the mountains for many occur in lowland forest. Of these four, two (*Pogonocichla* and *Stilbopsar*) occur also in the mountains of the Central Lake Region, leaving only *Suaheliornis* and *Artisornis* as endemic East African genera. The recently proposed *Artisornis* was considered by Sclater to be synonymous with *Apalis*; if this view be taken then *Suaheliornis* remains as the sole genus confined to the mountain rain forests of East Africa.

*Mammalian Fauna Associated with
the Mountain Rain Forest*

	Usambara Mtns.	Uluguru Mtns.	Usungwe Mtns.	Ukinga Mtns.	Rungwe Mtn.	Poroto Mtns.
Rhynchocyon cirnei hendersoni.....			L		L	?
Rhinonax petersi petersi.....	L	L			S	
Petrodromus sultan sultan.....	L		L			
Petrodromus nigriseta.....		L				
Crocidura martiensseni.....	T	L				
Crocidura bicolor elgonius.....		L				
Crocidura monax.....		L				
Crocidura maurisca geata.....		L				
Chlorotalpa tropicalis.....		L				
Chlorotalpa stuhlmanni.....			L	L	L	
Nandinia binotata arborea.....		L		L	L	
Bdeogale crassicauda omnivora.....	L	S				
Cercopithecus leucampyx monoides.....	L	L				
Cercopithecus leucampyx moloneyi.....			L	L	L	S
Colobus polykomos palliatus.....	L	L				
Colobus polykomos sharpei.....			S	L	S	S
Colobus badius gordonorum.....			L			
Anomalurus orientalis.....	L	L			?	
Heliosciurus undulatus undulatus.....	L		L			
Heliosciurus mutabilis shirensis.....				L	L	L
Funisciurus vexillarius.....	L					
Aethosciurus byatti byatti.....	L	L	L			
Aethosciurus byatti laetus subsp. n.				L		
Aethosciurus lucifer.....					L	
Dendromus mesomelas nyasae.....		L		L	L	?
Praomys tullbergi delectorum.....		L				
Praomys tullbergi melanonotus subsp. n. . .			L	L	L	L
Hylomyseus weileri.....		L	L	L		
Cricetomys gambianus osgoodi.....	L	L				
Cricetomys gambianus viator.....				?	L	
Lophuromys aquilus aquilus.....	L	L	L	L	L	L
Lophuromys sikapusi ansorgei.....					L	
Claviglis murinus isolatus.....			L			
Claviglis soleatus collaris subsp. n.....				L		
Cephalophus harveyi harveyi.....	L	L				
Cephalophus melanorheus schusteri.....	L	L				
Cephalophus melanorheus lugens.....				S	L	
Nesotragus moschatus moschatus.....	L	L				
Dendrohyrax terricola terricola.....	L					
Dendrohyrax terricola schusteri.....		L				
Heterohyrax lademanni.....				T	L	
TOTALS...	16	22	12	14	16	7

L = Collected by Loveridge.

S = Seen, but not collected.

T = Type locality.

Of mammals the only species taken in every range was a rat (*Lophuromys a. aquilus*) which, though usually found at the forest edge, undoubtedly adapts itself to bush life and a more generalized upland distribution. Of a dozen species common to both the Uluguru and Usambara Mountains, nine (or 75%) were not found in the southwestern highlands: on the other hand, fifteen (or 62%) of the twenty-four forms occurring in the southwestern highlands were not taken in the more northern mountains. The distribution is interesting as showing a less marked tendency to division between the faunae of the two areas than was found to be the case with the amphibians and reptiles. Undoubtedly mammals, owing to their ability to withstand climatic changes and their greater migratory powers, have presumably spread since conditions supervened which were inimical to further reptilian dispersal.

When we consider the twenty-three mammalian genera listed above, we find that sixteen (or 69%) are common to West Africa and only five (or 21%) are endemic in East Africa: the remaining two (or 8%) extend their range to the mountains of the Central Lake Region where, as with the reptiles, we find species common to the more eastern rain forests. Few, if any, mammalian species associated with the eastern forests, extend their range to the west coast without splitting up into races.

CONCLUSIONS AND SUMMARY

Any conclusions as to the present day distribution of vertebrate life must be based on considerations of climate and environment which in turn involves taking into account the geological history of the area which is being studied. Fortunately much of the route traveled had been covered only the year before by Dr. Bailey Willis, as Research Associate of the Carnegie Institute of Washington, and whose work "Living Africa" (1930) touches on the geology of the region under consideration.

Dr. Willis believes that: "In Mesozoic time Africa was a great plain that sloped very gently to sea level. The climate was monotonously tropical within the tropics and nowhere modified locally by heights that concentrate rainfall. Rivers meandered sluggishly in courses that are now lost." Then lifting force was exerted, warping the old plain and elevating some areas more than others, such unequal elevation resulting in the formation of escarpments by rupturing the surface; he cites the Iringa Highlands as an example of such warping,

the whole plateau having been raised 3,000 feet. Naturally such processes were extremely slow.

There is good evidence for the belief that at one time forest extended over much of tropical Africa, indeed Meinertzhagen (1930) referring to the remains of fossil trees in Egypt where no forest exists today, draws the following picture of the first Pluvial period in Egypt which "terminated about 370,000 years ago and during that period Northern Africa must have had a huge rainfall and would have been a most disagreeable country for residence. Vast forests must have clothed the desert, marshes would have filled every depression and huge rivers roared their way to the sea." (page 14.)

A vivid description of the tropical forest still existing in Tanganyika is given by a contributor to *The Handbook of Tanganyika* (1930), who writes: "The rain forest proper is confined to the mountain masses of Kilimanjaro, Meru, Usambara, Uluguru, Pare and Nguru, all in the north-east, but the mountains of Iringa and Rungwe in the south-west also have many remnants of the type. It is a wet dense mass of evergreen vegetation penetrable only with difficulty off the track. Great stems tower up through the tangled undergrowth and support an upper canopy inextricably interwoven by scandent lianas, shutting out the air and heat and light of the tropical sun. Underfoot is a thick carpet of rotting vegetation studded with fungoid growths which absorbs and holds the rainfall like a sponge and, after saturation, slowly yields it up to feed the streams issuing from the mountains and maintains their head of water well into the long drought seasons." (page 230.)

The conclusion seems inescapable that the dispersal of the amphibians, reptiles, and probably of some of the mammals inhabiting this luxuriant forest today, occurred at a remote period, possibly in the Miocene, when the forest belt was continuous from the Cameroons, through the Congo, past Elgon and Kenya to Witu on the east coast, southwards to Zanzibar (possibly to Kilwa along the coast) and inland as far as Meru, and the Usambara and Uluguru ranges. The forests of the Central Lake Region were possibly linked up with the Uganda forests lying to the north of them.

It would appear that a southward extension of forest connected the Kivu region with the Poroto Mountains and Rungwe and by this means permitted the distribution of such amphibia as *Arthroleptis adolfi-friederici*, *A. reichei*, and *A. schubotzi* to reach the southwestern highlands. Among the reptiles of that region *Atheris barbouri*, *Lygodactylus angularis*, *Brookesia platyceps* and other chameleons, though

specifically distinct, show affinities with Kivu species rather than with anything occurring upon the Usambara or Uluguru Mountains. With the mammals also, it is abundantly clear that a strong admixture of Kivu forms exists alongside a few races which are also to be found in the Usambara and Uluguru ranges.

With the destruction of the forest, the shade and surface moisture, essential to the existence of many lower vertebrates, disappeared and the forest fauna vanished together with the forest over great tracts of lowland and plateau but survived as a relic upon the mountains. It would appear that deforestation has taken place over much of the Uzungwe Mountains and resulted in changes inimical to the survival of the forest-dwelling forms. Matthews (1930) has stated: "It is to be observed that it is not the barrier that limits distribution in many instances, but the sharp diversity of climate conditioned by or associated with that barrier." (page 37.) In some portions of the Ukinga Mountains the survival of the forest and of the less progressive animal types associated with it, may be attributed to the steepness of the slopes which are at times even too precipitous to tempt a native agriculturist. Briefly then we may summarize the position as follows:

(1) We may postulate a very ancient trans-African forest connecting the Cameroon Mountains in the west with the Usambara and Uluguru ranges in the east: the Uluguru supporting the most southerly remanent of truly virgin tropical rain forest in East Africa.

(2) The vertebrates (omitting birds)' by their distribution overwhelmingly demonstrate a close connection between the Usambara and Uluguru until comparatively recent times yet sufficiently remote to have permitted the differentiation of quite a number of subspecies in the latter (or former) range.

(3) On the other hand there is little ground for visualizing a forest connection between the Uluguru and the southwestern highlands for the two groups have few species in common. Taken class by class we find that:

The Amphibian fauna of the Uluguru rain forest shows a close affinity with that of the Usambara range to the north and very little with that of the southwestern highlands. A heavy proportion of the genera (69%) are confined to East Africa and do not occur on the West Coast.

The reptiles show a similar disposition, a score of species being common to the Uluguru and Usambara and only three to the Uluguru and southwestern highlands. None of the genera are endemic in East Africa but all have West African representatives.

To a great extent the possession of flight negatives the value of any conclusions which may be drawn from the avifauna. Only two of the fifty-two genera are endemic, 93% are common to the mountains of the West Coast.

Among mammals, most of whose present day dispersal was presumably due to migrations during and since the Tertiary, the division is not so clearly cut, and until more is known of their distribution speculation is somewhat idle. Of the thirty-four *species* listed, thirteen (or 38%) are common to the Uluguru and Usambara and ten (or 29%), though as differentiated races, to the Uluguru and southwestern highlands. Of the twenty-three mammalian genera only five (or 21%) are endemic; 69% are common to West Africa.

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EXPLANATION OF PLATES

PLATE 1

PLATE 1

MAP SHOWING THE ROUTE TAKEN

The itinerary is marked by crosses. Landing at Dar es Salaam, the author passed through Morogoro, Dodoma, Iringa, Tukuyu, Abercorn, Ujiji, Mwanza, Bukoba, Entebbe, Jinja, Nairobi and sailed from Mombasa.



PLATE 2

PLATE 2

GRAZING LAND SHOWING FOREST REMNANTS ON THE LOWER
SLOPES OF RUNGWE MOUNTAIN at 2000 metres

It appears probable that most of this country has been deforested through human agency. It is rich in bird life but most of the species are wide-ranging forms, not local like those inhabiting the adjacent forest further up the mountain. (After photograph by Walther Goetze).



PLATE 3

PLATE 3

TROPICAL RAIN FOREST ON THE ULUGURU MOUNTAINS

between 1300 and 1400 metres

The evergreen tropical rain forest of East Africa supports a much richer and more varied fauna than the subtropical forests of the southwestern highlands. Only on Rungwe did the trees approach those of the tropical rain forest in magnificence and abundance. (After photograph by Walther Goetze).





Bulletin of the Museum of Comparative Zoölogy

AT HARVARD COLLEGE

VOL. LXXV, No. 2

REPORTS ON THE SCIENTIFIC RESULTS OF AN
EXPEDITION TO THE SOUTHWESTERN HIGHLANDS
OF TANGANYIKA TERRITORY

II

MAMMALS

BY GLOVER M. ALLEN AND ARTHUR LOVERIDGE

WITH ONE PLATE

CAMBRIDGE, MASS., U. S. A.

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FEBRUARY, 1933

No. 2.— *Reports on the Scientific Results of an Expedition to
the Southwestern Highlands of Tanganyika Territory*

II

Mammals

BY GLOVER M. ALLEN AND ARTHUR LOVERIDGE

The collection on which the following report is based, was made by the junior author while investigating the herpetological fauna of the southwestern highlands of Tanganyika Territory on behalf of the Museum of Comparative Zoölogy, aided by a grant from the Carnegie Institution of Washington.

The whole of the taxonomic work has been done by the senior author while the junior author has collaborated in contributing the field measurements and field notes. Where the singular pronoun is used in the taxonomic discussions it applies to the senior author, in the recounting of field observations to the junior.

The altitudes and other information regarding the localities in which collecting was carried on have already been dealt with in the introduction to this series of reports which treats of the whole vertebrate fauna of the southwestern highlands in relation to that of the Usambara and Uluguru ranges to the northeast.

The period of collecting mammals was from November 9, 1929, to July 1, 1930, during which time over 700 specimens representing 114 species or races of mammals were secured, of which 49 forms were new to the collections of the Museum of Comparative Zoölogy. Seven of these appear to be entirely new and are therefore described beyond:

<i>Suncus varilla minor</i>	Kitungulu, Urungu.
<i>Aethosciurus byatti laetus</i>	Madehani, Ukinga Mtns.
<i>Praomys tullbergi melanotus</i>	Uzungwe, Ukinga, Rungwe, etc.
<i>Leggada gerbillus</i>	Dodoma, Ugogo.
<i>Otomys anchietae lacustris</i>	Uzungwe, Ukinga, Rungwe, etc.
<i>Claviglis soleatus collaris</i>	Madehani, Ukinga Mtns.
<i>Cryptomys hottentotus oclusus</i>	Kigogo, Uzungwe Mtns.

Attention is also directed to such rare forms as *Rhynchocyon cirnei hendersoni*, *Chlorotalpa stuhlmanni*, *Colobus badius gordonorum*, *Aethosciurus lucifer*, *Thallomys damarensis scotti*, *Heterohyrax lademanni* and others of which good series were secured.

When measurements are given serially they are always in the following order:— (1) length from snout to anus; (2) length of the tail

without terminal hairs; (3) length of hind foot without claws; (4) length of ear from tip to notch. In the case of bats a fifth measurement is added: (5) length of wing from axilla to tip. All dimensions are in millimetres.

We should like to take this opportunity of thanking His Excellency the Governor of Tanganyika Territory and the Director of Game Preservation for their courtesies in furnishing the necessary license for scientific collecting. Thanks are also due Dr. Joseph Bequaert and Dr. J. H. Sandground of the Harvard Department of Tropical Medicine for their kindness in identifying the parasitic ticks and worms.

*List of Species Collected**

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<i>(Rhinonax petersi petersi</i> (Bocage))	53
<i>Petrodromus matschiei venustus</i> Thomas	55
<i>Petrodromus (Cercotenus) sultan sultan</i> Thomas	55
<i>Elephantulus ocularis</i> Kershaw	56
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* Species in parenthesis were not collected but are discussed.

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<i>Genetta stuhlmanni stuhlmanni</i> Matschie	74
<i>Nandinia binotata arborea</i> Heller	75
<i>Myonax grantii</i> (Gray)	75
<i>Myonax sanguineus proteus</i> (Thomas)	76
<i>Herpestes ichneumon funestus</i> (Osgood)	76
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<i>Heliosciurus undulatus rhodesiae</i> (Wroughton)	92
<i>Heliosciurus mutabilis shirensis</i> (Gray)	93
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ERINACEIDAE

ATELERIX ALBIVENTRIS HINDEI (Thomas)

Erinaceus hindei Thomas, 1910, Ann. Mag. Nat. Hist. (8), 5, p. 193: Kitui, near Mt. Elgon, Kenya Colony.

♂ ♀ (M. C. Z. 25708-9) Mangasini, Usandawi. 14. xii. 29.

♂ ♀ ♀ (M. C. Z. 26425, 26743-4) Ukara Id., Lake Victoria. 14-19. vi. 30.

Native names. *Kamasi* (Kisandawi); *kenye* (Kinyaturu); *nabuku* (Kikerewe).

Distribution. This hedgehog does not occur on Ukerewe Island according to Père Conrads; Ukara Island is close to Ukerewe; the absence of this animal from the larger island is possibly attributable to the presence of large numbers of Carnivora on Ukerewe.

Discussion. Of this series three show the paler type of coloring in which the spines are white-tipped, with a dark brownish-black band in the middle, then a whitish base. Two of the Ukara specimens have the whitish tips and bases pale ochraceous, but since both are older animals, this may be a result of age. It was apparently this variation which led Heller to describe *sotikae* which Hollister

has shown to be synonymous with *hindei*. In all, the feet and faces are dark brown.

Measurements. The largest ♂ (Ukara Id.) measured 160. 20. 25. 20 mm.; the largest ♀ (Mangasini) 135. 15. 26. 25 mm.

Diet. One hedgehog attacked and disembowelled a live Egg-eating Snake (*Dasypeltis scaber*) which had been temporarily placed in the same cage.

MACROSCELIDIDAE

RHYNCHOCYON CIRNEI HENDERSONI Thomas

Rhynchocyon hendersoni Thomas, 1902, Ann. Mag. Nat. Hist. (7), 10, p. 403: Plateau west of Lake Nyasa, Nyasaland.

♂ ♀ (M. C. Z. 26741-2) Dabaga, Uzungwe Mtns. 1. i. 30.

♀ ♀ (M. C. Z. 26739-40) Kigogo, Uzungwe Mtns. 18 & 20. i. 30.

♀ (M. C. Z. 26448) Nkuka Forest, Rungwe Mtn. 7. iv. 30.

also seven native skins without skulls, purchased at Dabaga.

Native names. *Sangi* (Kihehe); *kasonde* (Kinyakusa).

Discussion. With the elimination of *Rhynchocyon chrysopygus* and *petersi*, the black and rufous elephant shrews, to form a separate genus, *Rhinonax*, as proposed by Thomas (1918, Ann. Mag. Nat. Hist. (9), 1, p. 370), *Rhynchocyon* becomes limited to the checkered-backed species *R. cirnei* and its geographical forms, which occupy an area from central Tanganyika west to the eastern Belgian Congo and south into Mozambique. Typical *cirnei*, described by W. Peters from Mozambique, has the pattern least marked, consisting of two pairs of stripes on each side of the midline, broken into alternate chestnut and pale-buffy spots with a faint indication of a third clearly continuous lateral pale line. Its range extends at least to the south-eastern corner of Lake Nyasa.

In northern Nyasaland occurs *hendersoni*, the type of which probably came from near Livingstonia where Mr. Henderson lived who sent specimens to Thomas. In this form the ground color is darker and the broken stripes much better developed, the dorsal pair nearly black and continuous on the median border, and the alternating paler spots forming nearly whitish indentations on the outer portion. The second pair of stripes is more rufous but with the white spots equally contrasted and forming similar reëntnants on the outer edge of each; the third row of white spots is nearly continuous and is separated by a dark chestnut band from the row above it; the terminal fourth of the tail is white.

To the northeast, in eastern Tanganyika is a paler race, *swynnertoni*, with buffier ground color and slightly buffy instead of white spots, of which the Museum of Comparative Zoölogy has a pair of topotypes collected by Loveridge at Kipera, Kilosa.

To the northwest, on the plateau west of Lake Tanganyika, is found the much redder *reichardi* whose type locality is Marunga, eastern Belgian Congo. The late Dr. J. A. Allen has pointed out the extremes of color variation in the species, or subspecies, *stuhlmanni* of the Semliki River.

It is interesting to find that the form collected by Loveridge on Rungwe Mountain, at the northwest end of Lake Nyasa is obviously *hendersoni*, the dark color of which may be correlated with the more moist conditions under which it lives as contrasted with either *cirnei* or *swynnertoni*.

Measurements. The only ♂ (Dabaga) measured 250. 190. 70. 30 mm.; the largest ♀ (Rungwe) 270. 256. 70. 34 mm.

Breeding. A female killed at Kigogo was apparently suckling young; the specimen from Rungwe was not in breeding condition, there was no fetus. I found the nest of one of these animals in the Nkuka Forest at an elevation of 7,500 feet. The entrance was between two moss-covered roots of a sapling; these roots formed an arch whose apex was six inches from the ground. On the further side was a depression which appeared to have been scratched out by the elephant shrew, then filled with dead leaves till the total mass of leaves formed a domed nest in size and shape comparable to a regulation Rugby football. The animal curls up in the middle of this mass. I confess that I did not know what animal had made it until I had drawn Salimu's attention to the nest when he said immediately that it was the nest of an elephant shrew for in his own home forests on the Uluguru Mountains he had seen these creatures bolt from such nests when he had approached them.

Parasites. Tapeworms were found in the stomach of the Rungwe elephant shrew.

Habitat. The Dabaga specimen was shot in the New Forest Reserve just above the Sonson River on the left side of the Dabaga-Muhanga track. I shot one Kigogo shrew as it was running across an open sunlit patch in the rain forest. During three weeks spent hunting in this forest less than half a dozen shrews were heard or seen so it may be assumed that they are uncommon. The Rungwe animal lacks a right ear, an old injury, probably the result of fighting.

RHINONAX PETERSI PETERSI (Bocage)

Rhynchocyon petersi Bocage, 1880, Journ. Sci. Math. Phys. Nat. Lisboa, **7**, p. 159: Tanganyika Territory, region of Zanzibar.

Diet. On April 1, 1930, Salimu reported having seen a Peters' Elephant Shrew, a species with which he is perfectly familiar, feeding on soldier ants (*Dorylus nigricans burmeisteri*) which were crossing the path in the vicinity of the bamboo belt in the Nkuka Forest. Unfortunately we failed to secure any examples of this species during our stay in the forest.

PETRODROMUS MATSCHIEI VENUSTUS Thomas

Petrodromus venustus Thomas, 1903, Ann. Mag. Nat. Hist. (7), **12**, p. 339: Namwiwe, northern Nyasaland.

3 ♂ ♀ (M. C. Z. 25685-8) Unyanganyi, Turu. 6. xii. 29.

Native name. Nyenge (Kinyaturu).

Discussion. The four specimens of this beautiful buffy shrew from Unyanganyi, east of Singida, appear to constitute an extension of its known range from northern Nyasaland northward, well into central Tanganyika. They are strikingly pale in comparison with neighbouring forms, having a vinaceous dorsal area, bright buffy sides and white belly. The tail is black above and all round on its distal half. In style of coloration and the rather abundant hair of the tail they resemble *P. matschiei*, but are paler above, through a great reduction of the long black hairs. Their relationship is doubtless with the latter animal, of which they are here regarded as a subspecies.

Measurements. The largest ♂ measured 220. 170. 60. 38 mm.; the ♀ 220. 170. 60. 38 mm.

PETRODROMUS (CERCOCTENUS) SULTAN SULTAN Thomas

Petrodromus sultani Thomas, 1897, Proc. Zoöl. Soc. London, p. 435: Mombasa, Kenya Colony.

Petrodromus sultan Thomas, 1897, Proc. Zoöl. Soc. London, p. 928: correction of misprint.

♂ (M. C. Z. 26876) Kigogo, Uzungwe Mtns. 3. i. 30.

Native name. Dongi (Kihehe).

Discussion. A single native skin purchased at Kigogo, constitutes an interesting inland record for this coastwise species. Its dark

color, lacking the paler gray sides and with whitish instead of ochraceous belly indicate that it is a male.

ELEPHANTULUS OCULARIS Kershaw

Elephantulus ocularis Kershaw, 1921, Ann. Mag. Nat. Hist. (9), **8**, p. 563: Dodoma, Tanganyika Territory.

24 (M. C. Z. 25649-56, 58, 59, 61-68, 72, 74) Kikuyu, Dodoma. 21. xii. 29.

Discussion. This series of twenty skins and four alcoholics are really topotypes being collected in the same patch of country from which Loveridge secured the types. Kikuyu is only a couple of miles from Dodoma and rather less from Loveridge's former camp.

This elephant shrew is distinguished from the somewhat darker race following, chiefly by its much more extensive buffy to ochraceous tint which extends over the median area of the back, correlated perhaps with a rather hotter, drier environment.

Measurements. The largest ♂ measured 140. 125. 34. 25 mm.; the largest ♀ 145. 140. 35. 25 mm.

ELEPHANTULUS RENATUS Kershaw

Elephantulus renatus Kershaw, 1923, Ann. Mag. Nat. Hist. (9), **11**, p. 588: Gwao's village, near Singida, Tanganyika Territory.

33 (M. C. Z. 25648, 57, 60, 69, 77, 79, 82, 83 (+alcoholics)) Unyangany, Turu. 4-6. xii. 29.

18 (M. C. Z. 25670, 71, 73, 75, 76, 78, 80, 81, 84 (+alcoholics)) Mangasini, Usandawi. 12. xii. 29.

Native names. Mbulu or mbulu sange (Kinyaturu and Kisandawi).

Discussion. The above series of which twenty-two are alcoholics are distinctly of this form, as might be expected coming as they do from points just northeast and east of the type locality.

They are nearly uniformly buffy brown over the back, without the characteristic ochraceous tint of *E. ocularis* to which, however, they are evidently closely related. Both are no doubt to be regarded as only subspecifically related and probably should be entered as subspecies of *rufescens*.

Measurements. The largest ♂ (Mangasini) measured 135. 130. 30. 25 mm.; largest ♀ (Unyangany) 145. 130. 35. 25 mm.

Breeding. A young male measuring 60. 53. 25. 12 mm., obtained at Unyangany on December 4, had its stomach full of milk.

Parasites. Female nematodes (*Physaloptera* sp.) were present in Unyangany shrews.

SORICIDAE

SUNCUS LIXA (Thomas)

Crocidura (*Pachyura*) *lixa* Thomas, 1897, Proc. Zool. Soc. London, p. 930: Nyika Plateau, Nyasaland.

♀ (M: C. Z. 26759) Mwanza, Lake Victoria. 9. vi. 30.

Discussion. Shrews of this genus seem rare in Africa; perhaps they are already in process of becoming eliminated by the more numerous and progressive *Crocidura*. In its bicolor tail this Mwanza shrew agrees with the description of *lixa* of northern Nyasaland rather than with the dark-tailed *S. l. aequatoria* of the Taita Hills of Kenya Colony. The upper surface is distinctly gray with a faint brownish tinge, the lower side clear dark gray, the feet whitish, tail dark above, whitish below. The skull length is 19.5 mm.; basal length 17.7 mm.; palatal length 8.7 mm.; greatest width 8.5 mm.; upper toothrow 8.6 mm.; lower toothrow 7.7 mm.

Measurements. This ♀ measured 65. 46. 10. 8 mm.

Habitat. It was taken under the boxes in my tent where it probably found an abundant food supply in the hundreds of field cockroaches that swarmed in the grass. The tent was only fifty yards from the landing stage used by the Ukerewe boats.

SUNCUS VARILLA MINOR subsp. nov.

Type. No. 26,754 Museum of Comparative Zoölogy. Adult ♀ skin and skull from Kitungulu, Urungu, Tanganyika Territory. Collected by A. Loveridge, May 14, 1930.

Description. A minute shrew resembling *S. varilla* in its grayish-brown upper surface, but of somewhat smaller proportions; cranial length 15.2 mm. against 17.4 mm. in *varilla*. General color of entire dorsal surface of head and body pale cinnamon brown tinged with gray on account of the minute gray tips or subterminal rings of the hairs; longest hairs of the back about 4 mm.; sides and under surface of body clear gray tipped with whitish giving a silvery effect. Upper side of tail brownish with longer gray bristle hairs scattered throughout its length; its lower side pale whitish; backs of feet and bases of ears thinly clad with minute white hairs, upper part of ears brownish like back.

The skull is minute, considerably smaller than that of *varilla*, 15.2 mm. in greatest length. The main cusp of the large first upper

incisor is gently curved downwards, its basal cusp low and rounded. The first upper unicuspid is largest, its tip reaching the level of the cusp of the anterior incisor; the second and third unicuspids are nearly equal in size, the second minutely narrower in profile but its cusp quite as high as that of the third; the fourth unicuspid is much smaller, but stands full in the tooth row, is well visible in side view, and its cusp is almost half as high as that of the third.

Measurements. The field measurements of the type are as follows: head and body 45 mm., hence 7-12 mm. smaller than in *varilla* and *infinitesima*, but the short tail is about the same, 30 mm.; foot 10 mm.; ear 10 mm. The skull is intermediate in size between that of these two: greatest length 15.2 mm. (against 17.4 and 14.5 mm. respectively); basal length 14 mm.; palatal length 6.6 mm.; greatest breadth 6.8 mm.; upper tooth row 6.2 mm.; i^1 to p^4 inclusive 4.2 mm.; lower tooth row 6.1 mm.; lower jaw from condyle to tip of incisor 9.2 mm.

Discussion. This pygmy shrew differs from *S. infinitesima* (type from Rumruti, Laikipia Plateau, Kenya Colony) in its distinctly gray-mixed dorsal side, as in *varilla*, not uniform brown as in the former; in its slightly larger hind foot and larger skull, and in the relative size of the upper unicuspids, of which the first is large, the second and third subequal instead of the second markedly smaller (only about half the size of the third).

The members of this genus are so rare in collections that I cannot yet be certain of the range of individual variation in size, but since it does not seem possible wholly to reconcile the characters of this specimen with those of the few other described forms, I am regarding it as a smaller northern race of *S. varilla* of the Cape.

Habitat. This shrew was found beneath a log in dry orchard forest.

CROCIDURA NYANSAE KIVU Osgood

Crocidura flavescens kivu Osgood, 1910, Ann. Mag. Nat. Hist. (8), 5, p. 370: Lake Kivu, Eastern Belgian Congo.

♂ (M. C. Z. 26748) Dabaga, Uzungwe Mtns. 9. xi. 29.

♂ (M. C. Z. 26749) Kigogo, Uzungwe Mtns. 14. i. 30.

♂ ♀ ♀ (M. C. Z. 26745-7) Ukerewe Id., Lake Victoria. 16. vi. 30.

Native names. *Nyunga* (Kihehe); *msusukwe* (Kikerewe).

Discussion. These three large shrews agree in the dark velvety and glossy pelage, which is so different from that of other shrews

as to suggest possible aquatic habits. Two are immature but nearly full grown.

Two others from Dabaga and Kigogo in the Uzungwe Mountains are probably the same or at least closely related to this form, although a little smaller and less glossy (due to wear and fading of pelage). Their skulls are about 27–28 mm. long, upper toothrow 12 mm.

Measurements. Dabaga ♂ 115. 70. 20. 10 mm.; Kigogo ♂ 100. 66. 20. 10 mm., though it should be noted that the measurement of the foot when dried is 18 mm. The young ♂ from Ukerewe Island measured 100. 70. 20. 10 mm., as did also the young ♀, while the adult ♀ measured 125. 85. 20. 10 mm.

Parasites. The encapsuled larvae of an ascarid (Anisakinae) were very numerous on the back and hindquarters of the Kigogo shrew.

Enemies. Another of these shrews was recovered from the stomach of a Striped Schaapsteker (*Trimerorhinus tritaeniatatus*), also at Kigogo.

CROCIDURA NYANSAE NYANSAE Neumann

Crocidura flavescens nyancae Neumann, 1900, Zool. Jahrb. Syst., 6, p. 544: Fort Lubwa, Usoga, Uganda.

♂ (M. C. Z. 26750) Albertville, Lake Tanganyika. 21. v. 30.

Discussion. This single large shrew from Albertville, Belgian Congo, is probably nearer to *nyansae* than to *C. n. kivu*. It appears to be in fresh short pelage which is not yet fully grown out, giving it a pale brownish-gray tint. The typical form is supposed to be characteristic of the country at the north end of Lake Victoria.

Measurements. This ♂ measured 120. 85. 20. 10 mm.

Habitat. Taken beneath a bundle of thatching grass lying near an unfinished hut on the outskirts of the town and very near the lake shore.

CROCIDURA NEAVEI Wroughton

Crocidura neavei Wroughton, 1907, Manchester Mem., 51, no. 5, p. 7: Kafue River, Northern Rhodesia.

♂ ♀ (M. C. Z. 26257–8) Kigogo, Uzungwe Mtns. 31. i. 30.

Discussion. In his review of the African *Crociduræ* Dollman says that but two examples of this species were known, the type from Kafue River, northern Rhodesia, taken by Neave and a second secured by the same collector on the Kalungwisi River, east of Lake Meru. It is, therefore, a considerable eastward extension of the known range to record these two from Tanganyika.

The very dark blackish-brown color above, dark-gray underside, long hind feet and the long blackish tail with its very few bristles confined to the base, are distinctive characters.

Measurements. The ♂ measured 76. 66. 17. 10 mm.; the ♀ 80. 70. 17. 10 mm.

Habitat. Taken inside a decayed tree trunk at a height of about three feet from the ground.

CROCIDURA SUAHELAE Heller

Crocidura suahelae Heller, 1912, Smithsonian Misc. Coll., 60, No. 12, p. 6: Mazeras, Kenya Colony.

♀ (M. C. Z. 25689) Bagamoyo, Tang. Terr. 9. xi. 29.

Discussion. This reddish-brown shrew seems to be a coastwise species in Kenya Colony, so that it is not very surprising to find it at Bagamoyo on the coast in the adjacent part of Tanganyika Territory.

Measurement. This ♀ measured 85. 56. 14. 8 mm.

CROCIDURA HILDEGARDEAE HILDEGARDEAE Thomas

Crocidura hildegardeae Thomas, 1904, Ann. Mag. Nat. Hist. (7), 14, p. 240: Fort Hall, Kenya Colony.

4 (M. C. Z. 26755-8) Kigogo, Uzungwe Mtns. 27. i. 30.

5 (M. C. Z. 26252-6) Madehani, Ukinga Mtns. 22. ii. 30.

2 (M. C. Z. 26752-3) Igale, Poroto Mtns. 24. iv. 30.

1 (M. C. Z. 26751) Albertville, Lake Tanganyika. 21. v. 30.

Native names. *Nyunga* (Kihehe); *ntzeki* (Kikinga); *akasene* (Kinyakusa).

Discussion. As Hollister showed, this is a common and widely distributed species in eastern Africa. He recorded it from many localities in Kenya Colony as well as from Uganda and Kilimanjaro. In the series of twelve secured by Loveridge mostly in southwestern Tanganyika Territory, there seems to be nothing to separate them clearly from the typical form of this species, although they probably average a little darker brown. The specimen from Albertville extends the known range to the west side of Lake Tanganyika.

Measurements. The largest ♂ (Kigogo) measured 76. 66. 17. 10 mm.; the largest ♀ (Kigogo) 80. 70. 17. 10 mm.

Breeding. Three of these shrews were found beneath a log, rotted and concave on its lower surface, on the outskirts of the rain forest.

There was no nest and all three animals were active though only one ran away. This was a female which I took to be the mother for she was ten millimetres longer in the body than either of the pair of young which measured 65. 45. 15. 10 mm. A male captured the same day was actually taken seven miles away.

CROCIDURA BICOLOR CUNINGHAMEI Thomas

Crocidura cunninghami Thomas, 1904, Ann. Mag. Nat. Hist. (7), **14**, p. 240:
Island in Victoria Nyanza.

♀ (M. C. Z. 26383) Entebbe, Lake Victoria. 27. vi. 30.

Native name. *Karinurinu* (Luganda).

Discussion. This specimen seems to agree well with the description of the type which was taken on a small uninhabited island, a mile north of Sajitu Island in Victoria Nyanza. Since our specimen was taken under a log only ten feet from the lake shore, it may be that this species prefers the borders of streams or lakes.

Measurements. ♀ 65. 45. 14. 10 mm.

CHRYSOCHLORIDAE

CHLOROTALPA STUHLMANNI (Matschie)

Chrysochloris stuhlmanni Matschie, 1894, Sitzb. Ges. naturf. Freunde Berlin, p. 123: Runssoro near Karevia, Ukondjo and Kinjawanga, etc., Belgian Congo.

♂ (M. C. Z. 26736) Ihanganya, Uzungwe Mtns., 6. i. 30.

♀ (M. C. Z. 26738) Ludilo, Uzungwe Mtns. 8. i. 30.

♀ (M. C. Z. 26737) Kigogo, Uzungwe Mtns. 22. i. 30.

♀ (M. C. Z. 26447) Madehani, Ukinga Mtns. 2. ii. 30.

♀ (M. C. Z. 26314) Nkuka Forest, Rungwe Mtn. 17. iv. 30.

Native names. *Ifufula* (Kihehe); *lisukadope* (Kikinga).

Discussion. This series of five specimens is very uniform in general appearance, having the facial region soiled whitish or buffy, with a whiter spot marking the eye (? or ear). The fur of the dorsal side is glossy blackish brown with green and purplish reflections, the lower surface grayer. They doubtless represent Matschie's *stuhlmanni*. In this genus there are normally forty teeth (ten in each jaw on each side) but one specimen (No. 26,736) has eleven on each side above although only ten in the mandible on each side. The eleventh tooth,

perhaps representing an original m^3 , is similar to the usual last tooth, transverse, and slightly pear-shaped in crown view.

All the specimens agree in having such inflated bullae that the greatest antero-posterior diameter of the bulla equals the distance from bulla to last molar, whereas in the unique specimen from the Uluguru Mountains which we described as *C. tropicalis*, the bullae are so much smaller, that the distance between the bulla and the last molar is nearly one and a half times this diameter. In addition the Uluguru animal is browner with a clear white and more extensive facial mask than in any of the five specimens of *stuhlmanni*.

Measurements. The single ♂ measured 135. 0. 13. 0 mm.; the largest ♀ (Madehani) 130. 0. 10. 0 mm.

Breeding. None of the four females appeared to be breeding.

Enemies. A skull is also preserved which I imagine resulted from a disintegrated pellet disgorged by an owl; this skull was in the bottom of a saw-pit in the Nkuka Forest.

Habitat. The Ihanganya specimen was found lying dead beside the path near Jumbe Ubamba's village; two carrion beetles were crawling over it. The mole was very dragged and had apparently been drowned out of its burrow by the almost continuous rain of the past forty-eight hours; probably exposure had finished the creature when in an exhausted and half-drowned condition.

On arrival at Ludilo I showed the skin of this mole to a group of natives (as I had done at each halting place on the way) and offered fifty cents (12c in U. S. currency) for every one that might be brought in in good condition. I saw a bright-faced youngster look up at his aged father and say something quickly in Kihehe. "Go, bring it," was the terse reply in Kiswahili. The boy broke away from the group and raced off in the direction of the gardens. Presently he returned walking, gingerly holding a dead mole between two sticks. I put the fifty cents in his hand and the look of wondering amazement that he gave me was most refreshing. He looked from me to the fifty-cent piece, turned it over, then looked at his father, who told him to keep it. It was probably the first fifty cents he had ever possessed as their home was in a very remote spot. I told him to go and bring me some more at the same price but he shook his head; it transpired that the one he had brought had been killed and thrown away that morning when hoeing was in progress. The lad remained for an hour watching me at work, so it was pretty evident that he thought further search would be useless, for several times I reminded him that there were only two hours of daylight left and that, as I

would be leaving at dawn, his opportunity would then be gone. His attitude merely corroborated that of the natives whom I had interrogated along the way, they one and all considered that searching for an *ifufula* was a hopeless business.

The Kigogo and Madehani moles were brought in by natives, and though I was camped for three weeks at each of these places no others were forthcoming despite special encouragements being offered.

On arrival at the Nkuka Forest, we found old bamboo mole-traps and set many ourselves but without result. Moles seemed to be more plentiful on Rungwe than in any other place that we had visited, fresh lines of upturned earth would appear every few days in the vicinity of the camp but though the local natives were urged to hunt for them, none was produced. The day before we left Rungwe I told Salimu to take a labourer and make the securing of a mole his first business. He started digging where two days before a mole had raised a trail across a path close to my tent. After three hours excavating he located the mole, a female, in its nest — a mass of dry leaves — under the sheltering roots of a large tree within a hundred feet of my tent! I was called and observed an insect running over the leaves which had formed the nest. Salimu stated that there had been many of them but that the others had disappeared. I secured the one that remained.

PTEROPIDAE

EPOMOPHORUS MINOR Dobson

Epomophorus minor Dobson, 1880 (for 1879), Proc. Zool. Soc. London, p. 715: Zanzibar.

10 (M. C. Z. 26214–23) Mwaya, Lake Nyasa. 5–7. iii. 30.

1 (M. C. Z. 26707) Ujiji, Lake Tanganyika. 26. v. 30.

Distribution. Andersen, in his monograph of the family, records this bat from the Zanzibar region on the coast and from Ujiji, Lake Tanganyika; the present series extends the known range southwards to Lake Nyasa.

Native name. *Ilipulumusi* (Kinyakusa).

Discussion. The whole series consists of males; in none of the nine fully adult specimens do the temporal ridges meet to form a sagittal crest, in contrast to the condition in *E. anurus*. All the series agree in their dark-brown color above, prominent white epaulettes and

whitish abdomens; at the sides of the chest the dark brown becomes smoky brown.

Measurements. The largest ♂ measured 115. 0. 15. 20. 200 mm.; juvenile ♂ (Ujiji) 60. 0. 15. 22. 185 mm.

Breeding. The fact that only males were obtained at Mwaya would suggest that the females were roosting apart with young at this time — March 7. At Ujiji a young animal was independent.

Parasites. One Mwaya bat had some parasites, which I failed to detach, along the edges of its right wing; another a parasitic dipteran, *Tripselia amiculata*, which was preserved; others were collected from the fur of the Ujiji bat.

Habitat. The Mwaya series were shot from palms and mango trees surrounding the hospital; they were hanging singly or in groups of two and three.

EPOMOPHORUS ANURUS Heuglin

Epomophorus anurus Heuglin, 1864, Nova Acta Acad. Leop. Carol., Halle, **31**, pt. 8, p. 12: Bongo, Bahr el Ghazal.

1 (M. C. Z. 26426) Iloilo, Rungwe. 31. iii. 30.

9 (M. C. Z. 26682-90) Ukerewe Id., Lake Victoria. 14. vi. 30.

Discussion. There are apparently no adult males in the series. In none is there a well-marked whitish abdominal area, but instead the lower side is nearly uniform pinkish buff, only slightly paler on the belly.

Measurements. The largest ♂ measured 115. 0. 15. 25. 230 mm., the largest ♀ 115. 0. 16. 21. 230 mm. A juvenile ♀ from Iloilo 85. 0. 15. 25. 160 mm.

Habitat. The series was obtained from mango trees near the mission where they roosted.

EMBALLONURIDAE

COLEURA AFRA (Peters)

Emballonura afra Peters, 1852, Reise nach Mossamb., **1**, p. 51, pl. 12, fig. 1 and pl. 13, figs. 18 and 19: Tette, Mozambique.

15 (M. C. Z. 26725-34) Mwanza, Lake Victoria. 6. vi. 30.

Discussion. The capture of a series of this rare bat at Mwanza extends its known range in East Africa from Voi on the coast, to the Central Lake Region. Hollister suggested that *gallarum* may prove to be merely a subspecies of it, but probably it is really a dis-

inct species, with shorter forearm and brown instead of sooty color. The upper canines of *afra* have a very pronounced cingulum cusp on the inner side, about as large as the incisor; the minute upper premolar too has a distinct cingulum and low rounded crown. Five of the series are preserved in alcohol.

Measurements. The largest ♂ measured 60. 20. 10. 15. 150 mm.; only ♀ 65. 20. 10. 15. 150 mm.

Habitat. Attracted by the squeaking of bats to some large caverns among the jumble of massive rocks on a headland a few miles north of Mwanza, I climbed down into a great, yet well-lighted, cavern. From the rocky ceiling numbers of bats depended by their feet but each was separate from its fellows and not in clumps or even very close together, so that each one was shot separately with dust shot from a .22 cartridge.

TAPHOZOUS MAURITIANUS E. Geoffroy

Taphozous mauritanus E. Geoffroy, 1813, Description de l'Egypte, 2, p. 127: Mauritius.

1 (M. C. Z. 25721) Unyanganyi, Turu. 7. xii. 29.

2 (M. C. Z. 26226, 26270) Mwaya, Lake Nyasa. 7. iii. 30.

2 (M. C. Z. 26718, 26722) Ujiji, Lake Tanganyika. 25. v. 30.

Distribution. Also seen on the coconut palms at Bagamoyo.

Native name. *Ilipulumusi* (Kinyakusa).

Discussion. This wide-ranging species is doubtless, as suggested by Lang and Chapin, characteristic of bush-veld country in eastern Africa, avoiding forests. They found it in the eastern Congo frequently hanging by day close under the projecting thatch of houses, but in Tanganyika it seems to be associated more often with palms and mango trees.

Measurements. The largest ♂ measured 85. 20. 15. 20. 195 mm.; larger ♀ 95. 26. 12. 21. 197 mm., from Mwaya and Unyanganyi respectively.

Habitat. From a solitary palm (? bussu) at Unyanganyi, and ornamental palms forming an avenue to the hospital at Mwaya.

TAPHOZOUS SUDANI Thomas

Taphozous sudani Thomas, 1915, Ann. Mag. Nat. Hist. (8), 15, p. 561: Mongalla, Upper Nile.

♀ (M. C. Z. 26724) Igale, Poroto Mtns. 30. iv. 30.

Discussion. This single example agrees closely with the original description of a specimen from the Upper Nile and with specimens

listed by J. A. Allen, Lang and Chapin from the northeastern Uele District. Its occurrence at Igale constitutes another interesting locality record and extends its known range considerably to the south to the vicinity of the north end of Lake Nyasa. Its nearly uniform sooty-brown body with white bases to the hairs and its whitish wings are obvious characters.

Measurements. ♀ 80. 30. 13. 19. 190 mm.

Habitat. Taken in a rock crevice.

NYCTERIDAE *

NYCTERIS AETHIOPICA LUTEOLA Thomas

Nycteris aethiopica luteola Thomas, 1901, Ann. Mag. Nat. Hist. (7), 8, p. 30: Kitui, Kenya Colony.

22 (M. C. Z. 25722-7, 25729, 28112-5) Unyanganyi, Turu. 7. xii. 29.

Native name. *Tai* (Kinyaturu).

Discussion. The whole series, of which fifteen are preserved in alcohol, includes adults of both sexes as well as several naked young. They were taken from a hollow baobab tree by four native lads.

Measurements. The largest ♂ measured 75. 57. 15. 30. 165 mm.; and ♀ 72. 65. 15. 33. 170 mm.

Breeding. Several of the females were nursing young.

NYCTERIS DAMARENSIS DAMARENSIS Peters

Nycteris damarensis Peters, 1870, Monatsber. Akad. Wiss. Berlin, p. 905, fig. 7: Damaraland, Southwest Africa.

4 (M. C. Z. 25730-3) Saranda, Ugogo. 17. xii. 29.

Discussion. These specimens with forearm 46-48.5 mm. seem best referred to the typical race. Their long ears and pale grayish-brown backs and almost whitish underside distinguish them from the small dark *revoili* and the larger *N. a. luteola*.

Measurements. The larger ♂ measured 50. 50. 10. 30. 140 mm., and both ♀ ♀ 55. 60. 10. 30. 142 mm.

Breeding. One female carried a young male measuring 45. 40. 10. 25. 120 mm.

Habitat. All four were hanging in a grass hut in the government rest camp.

* *Nycteris* takes precedence over *Petalia* by fiat of the International Zoölogical Congress.

NYCTERIS REVOILI A. Robin

Nycteris revouli Robin, 1881, Bull. Soc. Philom. Paris, 5, p. 90: Somaliland.

10 (M. C. Z. 28126-35) Unyanganyi, Turu. 7. xii. 29.

4 (M. C. Z. 26427-30) Madehani, Ukinga Mtns. 25. ii. 30.

Discussion. The four examples from Madehani average much sootier brown than specimens from the drier thorn-bush country of eastern Tanganyika and Kenya Colony. One is, however, quite the same shade of dark brown above, so that the darker shade of the others is perhaps due to immaturity though they are fully grown. The skulls are slightly smaller than those of *capensis* to the south, with longer crests.

Measurements. The only Madehani ♂ measures 50. 55. 10. 30. 135 mm., and the largest Madehani ♀ measures 50. 55. 10. 30. 135 mm.

Habitat. If the statement of their native captors is to be relied upon the Unyanganyi series (preserved in alcohol) were taken in the same hollow baobab tree together with the series of *Nycteris aethiopica luteola* and a pair of *Rhinolophus lobatus* Peters.

RHINOLOPHIDAE

RHINOLOPHUS HILDEBRANDTI ELOQUENS Andersen

Rhinolophus hildebrandti eloquens Andersen, 1905, Ann. Mag. Nat. Hist. (7), 15, p. 74: Entebbe, Uganda.

♀ (M. C. Z. 25728) Unyanganyi, Turu. 7. xii. 29.

Discussion. This single specimen in its measurements represents about the maximum given by Andersen for topotypes of this race from Entebbe — forearm 60.5 mm., third metacarpal 43 mm., fourth and fifth metacarpals 46 mm., tibia 25.8 mm., foot 13.6 mm. In the skull the minute upper premolar, though forced outward from the tooth row, nevertheless separates the canine and the large premolar by a minute space. In the lower jaw, the minute premolar is lacking on the right side, but present on the left as a minute spicule under the cingulum of the large p⁴. No doubt, as suggested by Andersen, this is an inland form, characteristic of the Central Lake Region; the present record perhaps constitutes the most southeasterly made.

Measurements. ♀ 65. 60. 15. 30. 160 mm.

RHINOLOPHUS LOBATUS Peters

Rhinolophus lobatus Peters, 1852, Reise nach Mossamb., 1, p. 41, pls. ix and xiii, figs. 16 and 17: Sena, Mozambique.

2 (M. C. Z. 28136-7) Unyanganyi, Turu. 7. xii. 29.

Native name. *Tai* (Kinyaturu, but not specific).

Discussion. This pair, a male and female, are preserved in alcohol.

Habitat. According to their native captors, these bats were taken in a hollow baobab tree in company with two species of *Nycteris*.

HIPPOSIDERIDAE

HIPPOSIDEROS RUBER (Noack)

Phyllorhina rubra Noack, 1893, Zoöl. Jahrb. Syst., 7, p. 586: "Lugerrunjere River."

♀ (M. C. Z. 26675) Ukerewe Id., Lake Victoria. 10. vi. 30.

Discussion. The single specimen from Ukerewe Island is in the gray phase in which the pelage is uniformly sooty above to the roots of the hairs; drab below.

Measurements. ♀ 45. 38. 10. 15. 150 mm.; the forearm measures 50 mm.

MEGADERMIDAE

LAVIA FRONS REX Miller

Lavia rex Miller, 1905, Proc. Biol. Soc. Washington, 18, p. 227: Taveta, Kenya Colony.

♂ ♀ (M. C. Z. 26694-5) Ujiji, Lake Tanganyika. 28. v. 30.

♂ ♀ and young (M. C. Z. 26691-3) Ukerewe Id., Lake Victoria. 10-18. vi. 30.

Discussion. These represent the larger East African race of the handsome yellow-winged bat. Two of the Ukerewe specimens are young, the smaller about a third grown, June 10, the other of nearly adult proportions, June 18.

Measurements. The largest ♂ measured 75. 0. 18. 46. 185 mm., and largest ♀ 75. 0. 15. 46. 195 mm., both from Ukerewe Island.

Habitat. Ujiji specimens were shot from mango trees forming an avenue in one of the main roads.

VESPERTILIONIDAE

MYOTIS BOCAGII HILDEGARDEAE Thomas

Myotis hildegardeae Thomas, 1904, Ann. Mag. Nat. Hist. (7), **13**, p. 209: Fort Hall, Kenya Colony.

2 (M. C. Z. 26699-700) Kasanga, Lake Tanganyika. 16-17. v. 30.

Discussion. These two males are quite like a specimen from Aba, Belgian Congo. The bright fulvous red of the back is in contrast to the gray of the undersurface faintly washed and buffy.

Measurements. The larger ♂ measured 52. 45. 10. 15. 125 mm.; forearm 38 mm.

Habitat. Taken in domestic banana plants.

PIPISTRELLUS NANUS (Peters)

Vespertilio nanus Peters, 1852, Reise nach Mossamb., **1**, p. 63, pl. 16, fig. 2: Inhambane, Mozambique.

3 (M. C. Z. alcoholic) Bagamoyo. 16. xi. 29.

10 (M. C. Z. 26431-40) Madehani, Ukinga Mtns. 24. ii. 30.

1 (M. C. Z. 26696) Kitungulu, Urungu. 15. v. 30.

7 (M. C. Z. 26697-8, 26701-5) Kasanga, Lake Tanganyika. 16. v. 30.

1 (M. C. Z. 26441) Mabira Forest, Uganda. 1. vii. 30.

Native names. *Lilema* (Kikinga); *kasusu* (Kirungu).

Discussion. A considerable series of these little bats was obtained. They agree completely with Peters' description. There is relatively little color variation in the series, most of them being dusky brown above and gray below with dark-based hairs. A few, however, show a brighter tint, yellowish brown above, faintly washed with the same below. The Uganda specimen is slightly darker than the others, perhaps due to immaturity.

Measurements. The largest ♂ (Ukerewe) measured 45. 38. 5. 10. 150 mm.; and largest ♀ (Madehani) 45. 35. 5. 10. 100 mm.

Habitat. It is probable that the Madehani series, brought in by a native, were taken in some adjacent low-lying valley as none was seen as high as the village. Wild bananas, however, are common and these were examined without results. I personally took the Bagamoyo and Kitungulu bats from the central shoot, as yet unfurled, of domestic banana plants.

PIPISTRELLUS RÜPPELII (Fischer)

Vespertilio rüppelii Fischer, 1829, Synopsis Mamm., p. 109: Dongola, Sudan.

♀ (M. C. Z. 26706) Kasanga, Lake Tanganyika. 17. v. 30.

10 (M. C. Z. 26665-8, 26676-81) Ukerewe Id., Lake Victoria. 10 vi. 30.

Discussion. The series from Ukerewe Island includes only one adult male, six adult females and three immatures, perhaps two-thirds grown. The contrastingly pure white under side and the brownish-gray back make an unusual color pattern in this genus. Indeed, Miller and J. A. Allen include the species in the genus *Scotozous*, but Hollister in his list of East African specimens in the United States National Museum, relegates it, and I believe correctly, to *Pipistrellus*, for, as this fine series clearly shows, the small outer upper incisor is not vestigial ("not extending beyond the cingulum of the inner") but is only a little shorter than the large cusp of the inner tooth, and stands normally in the alveolar line. The Kasanga specimen is from the extreme southeastern end of the lake.

Measurements. ♂ 55. 35. 8. 15. 110 mm.; largest ♀ 50. 40. 8. 12. 110 mm.

Habitat. The single bat from Kasanga was found at a height of about five feet from the ground beneath plaster on the wall of the ruined German fort at the south end of the bay.

GLAUCONYCTERIS ARGENTATA (Dobson)

Chalinolobus (Glauconycteris) argentatus Dobson, 1875, Proc. Zoöl. Soc. London, p. 385: Cameroon Mountains.

3 (M. C. Z. 26227-9) Mwaya, Lake Nyasa. 5-6. iii. 30.

Native name. *Ilipulumusi* (Kinyakusa).

Discussion. These three specimens are tentatively referred to *G. argentata*, the type locality of which is Cameroon Mountains, West Africa, an area of greater humidity and hence likely to be inhabited by darker-colored forms than those of the drier country to the east of the lakes. Two of them are immature, the third somewhat older, and just changing from the dark drab coloring of youth (which still shows as two broad bands along the sides) to the paler-buffy brown of the adult, which is already coming in as a narrow triangular patch in the centre of the upper back.

Measurements. ♂ 45. 42. 7. 12. 132 mm.; ♀ 52. 50. 7. 12. 140 mm.

MOLOSSIDAE

MOPS (ALLOMOPS) OSBORNI J. A. Allen

Mops (Allomops) osborni J. A. Allen, 1917, Bull. Amer. Mus. Nat. Hist., **37**, p. 473: Kinshasa, near Leopoldville, Belgian Congo.

13 (M. C. Z. 26708-17, 19, 21, 23) Ujiji, Lake Tanganyika. 25. v. 30.

Distribution. This large species, first described from the Lower Congo, was next recorded from the Lake Region by Loveridge who secured it at Kisumu on the east shore of Lake Victoria. The present series extends the known range southward to the shores of Lake Tanganyika.

Discussion. There are a few minor points wherein these skins do not wholly agree with the original description — thus the fur on the back is said to be whitish at the extreme base, but in our series the fur is uniformly brown throughout. In none of the specimens is the sagittal crest so high as in the type, but in measurements there is a fairly close correspondence. In only one male is the tuft of long hairs of the forehead very prominent, perhaps because it is partly white and stands out.

Measurements. The largest ♂ measured 80. 45. 15. 18. 175 mm.; the largest ♀ 75. 45. 15. 18. 175 mm.

Habits. These bats are a great nuisance to householders both at Kigoma and Ujiji. In passing along the streets one frequently gets a pungent whiff from some house in which these animals have been pleased to take up their residence.

CHAEREPHON LIMBATUS (Peters)

Dysopes limbatus Peters, 1852, Reise nach Mossamb., **1**, p. 56, pl. 14: Mozambique.

1 (M. C. Z. alcoholic) Mombasa Id., Kenya Colony. 28. x. 29.

Habits. This free-tailed bat flew on board the liner when lying in Kilindini harbor and was found sprawling about the deck. Preserved in alcohol.

CANIDAE

THOS MESOMELAS MCMILLANI Heller

Thos mesomelas mcmillani Heller, 1914, Smithsonian Misc. Contr., **63**, no. 7, p. 6: Mtoto Andei, Kenya Colony.

♀ (M. C. Z. 27149) Near Njombe, Ubena Mtns. 6. ii. 30.

Native names. *Nchewe* (Kihehe); *ngewe* (Kikinga); the Banyakusa have several names probably indicating that they are acquainted

with more than one species of jackal: *imbera*, *imbila*, *akambwe*, *ingewe* (Kinyakusa, the first two are renderings of the same word).

Distribution. Jackals, whether of this or allied subspecies, were seen on several occasions; the first at dusk when motoring from Mpwapwa to Igulwe on 23. xi. 29; another west of Ipemi at 10 a.m. when it was trotting along a distant hillside, pausing now and again to watch the safari, this was on 8. i. 30; another just after sunset about twenty miles north of Mufindi on 1. ii. 30. Skins were offered for sale at both Ilolo and Nyamwanga in Rungwe District.

Discussion. The single specimen is no doubt referable to this race of the coast region and rift valley, and agrees well with other East African skins except that the red of the sides and haunches is a little less intense, and the dorsal area is unusually silvery due to the long white rings on the hairs which show through, while the black tips seem less evident than usual.

Measurements. ♀ 650. 300. 135. 100 mm.

Parasites. A tick (*Rhipicephalus sanguineus*) was found on its ear.

Habits. I shot this animal about 9 p.m. as it was trotting along the road ahead of the lorry in which we were travelling. The first shot—No. 3 from the choke bore—hit it behind without touching any vital spot, but caused it to jump round, when I killed it with No. 8 from the other barrel. It sprang into the air and dropped unconscious where it had stood.

Folklore. An old man of the Banyakusa tribe told me at Ilolo that if you heard a jackal calling you should go out and say, "What is it?" This is done by the knowing ones who inquire, "Is it a death?" to which the jackal will reply, "Yes," if this is the case; on the other hand, if war is impending and you ask, "Is it war?" the animal will remain silent.

OTOCYON MEGALOTIS VIRGATUS Miller

Otocyon virgatus Miller, 1909, Smithsonian Misc. Coll., 52, p. 485: Naivasha Station, Kenya Colony.

♂ (M. C. Z. 25739) near Gwao's village, Singida. 2. xii. 29.

Native name. *Bili* (Kinyaturu).

Discussion. The specimen is an old male with much worn molars. Hollister's suggestion that this and other named forms are merely subspecies of *O. megalotis* is doubtless the correct view.

Measurements. ♂ 480. 250. 115. 100 mm.

Diet. A migratory locust and termites were in its stomach.

Habits. Shot at night as it was trotting along the road.

MUSTELIDAE

AONYX CAPENSIS subsp.

Lutra capensis Schinz, 1821, Cuv. Thierreich, 1, p. 214: Cape region, South Africa.

♀ juv. (M. C. Z. 26544) Igale Pass, Poroto Mtns. 24. iv. 30.

Discussion. This young female with the milk dentition only is too immature for subspecific determination since most of the distinctions are based on relative size of teeth or body. The toes of the fore feet are quite without claws but those of the hind feet have each a small flattened nail. An excellent account with figures of the milk dentition is given by J. A. Allen in the report on "Carnivora collected by the American Museum Congo Expedition," 1924.

Distribution. Otters occur at Mwaya and around the shores of Lake Nyasa. While we were searching for aquatic cobras at Kipili on Lake Tanganyika, Salimu saw an otter among a pile of rocks; they are said to be common there.

Measurements. This ♀ measured 315. 165. 70. 15 mm. when it died on May 6, 1930.

Breeding. On April 24 a native met me on the road as I was returning from a hunt and showed me a baby otter. I offered him a shilling for it which he accepted, adding casually that perhaps I might give one and sixpence (37 cents U. S. currency). I asked him where was the second cub, but he replied that he had but one. On reaching camp I took immediate precautions to make the little beast comfortable for it was trembling with the bitter cold at this high elevation. As I was making arrangements for it, I remarked that I wished that there had been two for they would have helped to keep each other warm. It was only then that I learned that there had been two, that the second, in charge of another native, had been waiting near camp for my return. I sent a boy to get it; he returned saying that the man refused to sell it and had run off saying that he was going to eat it. All next day I endeavoured to trace it but only met with lies, for everybody denied knowledge of who had it or where it was, etc. My own personnel said that it had probably been killed to make medicine.

Folklore. I was informed that a piece of otter skin applied to a stiff neck would cure it and that this belief was held by most tribes.

An old Mnyakusa told me that only chiefs were allowed to wear otter skins in former days, if a commoner was found doing so it was

taken from him and he was fined an ox. Thus it became customary for any man who was so fortunate as to kill an otter to hand over the skin to the chief.

VIVERRIDAE

CIVETTICTIS CIVETTA SCHWARZI Cabrera

Viverra civetta orientalis Matschie (not *V. orientalis* Hodgson, 1842 = *V. zibetha* Linnaeus), 1891, Arch. für Naturgesch., 1, p. 352: Zanzibar.

Civettictis civetta schwarzi Cabrera, 1929, Mem. R. Soc. Español. Hist. Nat., Madrid, 16, No. 1, p. 36, footnote: Bagamoyo, Tanganyika Territory.

♀ (M. C. Z. 26480) Ukerewe Id., Lake Victoria. 17. vi. 30.

Discussion. This is a very fine large specimen, with a skull measuring 157.5 mm. in condylobasal length, hence slightly exceeding the largest male in Dr. J. A. Allen's list of Congo specimens. Like them it has the black band of the cheeks continuous across the snout instead of broken as in the typical race; the pale ground color of the body is slightly but clearly buff instead of white.

Cabrera has proposed the name *schwarzi* to replace *orientalis*, invalidated through its previous use by Hodgson for an Indian civet.

Measurements. This female measured 910. 440. 140. 55 mm.

Parasites. Ticks (*Rhipicephalus simus* and *Haemaphysalis leachi*).

Habitat. Civets are common in the open bush which covers much of Ukerewe Island. I shot this specimen at night when it was attracted to the dead body of a baboon placed near the tree in which I was spending the night.

GENETTA STUHLMANNI STUHLMANNI Matschie

Genetta stuhlmanni Matschie, 1902, Verh. V. Int. Zool.-Congr., Berlin, p. 1142: Bukoba, Tanganyika Territory.

Skin (M. C. Z. 26878) Dabaga, Uzungwe Mtns. 3. i. 30.

Native name. *Tondolega* (Kihehe).

Discussion. A skin, purchased from the natives, represents this species and is identical in coloring with examples from Kenya. German settlers at Dabaga confirmed the occurrence of genets there.

NANDINIA BINOTATA ARBOREA Heller

Nandinia binotata arborea Heller, 1913, Smithsonian Misc. Contr., 61, no. 13, p. 9: Lukosa River, northeast of Kisumu, Kenya Colony.

1 (M. C. Z. 27148) Madehani, Ukinga Mtns. ii. 30.

1 (M. C. Z. 26550) Nkuka Forest, Rungwe Mtn. iv. 30.

Native names. *Imbukula* (Kikinga & Kinyakusa); *imbuli* (Kinyika).

Discussion. These two native-made skins indicate the presence of this tree-civet in the mountains of southwestern Tanganyika Territory. The Madehani skin has been remade from a bag; the vendor of the Rungwe specimen assured Loveridge that it had been taken in the Nkuka Forest.

In their reddish dorsal coloring, unspotted bellies and narrow-ringed tails they agree with Heller's description of the eastern form, but a comparison with Cameroon skins shows that the range of color variation is considerable and that the color characters are hardly diagnostic.

MYONAX GRANTII (Gray)

Calogale grantii Gray, 1864, Proc. Zool. Soc. London, p. 561: Tanganyika Territory. "Mgunda Mkali¹."

♀ (M. C. Z. 26546) Kigogo, Uzungwe Mtns. 14. i. 30.

Native name. *Lukwiru* (Kihehe).

Discussion. This beautiful mongoose seems to be uncommon in collections. Its nearly uniform bright-ochraceous coloring with a deep-chestnut tail-tip render it a striking species. The skull measures: greatest length 68 mm.; basal length 64 mm.; palatal length 35 mm.; zygomatic width 32.3 mm.; mastoid width 24 mm.; width outside molars 21.5 mm.; upper tooth row 28 mm.; lower tooth row 28 mm. The skull differs in minor details from that of the specimen I identify as *proteus*, having slightly broader upper molars, longer ear bullae and pterygoids.

Measurements. ♀ 325. 285. 60. 25 mm.

Parasites. Nematodes (*Dujardinia* sp.) were numerous in its stomach.

Habits. This mongoose was one of three which ran across a path through dense undergrowth, then paused to look back at me. I approached the copse silently, then heard the others calling to it with a whistling cry; presently one scolded close by in the tangled cover, I moved slightly and it sprang back having come to within ten feet of me.

¹ *Mgunda* is a Kiswahili substantive for cultivated lands, *mkali* the adjective for fierce. It would seem more probable that this is an incorrectly transcribed name for the animal rather than the type locality.

MYONAX SANGUINEUS PROTEUS (Thomas)

Mungos gracilis proteus Thomas, 1907, Ann. Mag. Nat. Hist. (7), 19, p. 119: Ruwenzori East. Thomas & Wroughton, 1910, Trans. Zoöl. Soc. London, 19, p. 496, pl. 21.

1 (M. C. Z. 26879) Dabaga, Uzungwe Mtns. 3. i. 30.

1 (M. C. Z. 26540) Igale, Poroto Mtns. 26. iv. 30.

Native name. *Kikindi* (Kihehe, according to the vendor of the Dabaga skin).

Discussion. These two specimens are provisionally referred to the race *proteus*, first described from Mt. Ruwenzori. The Dabaga specimen, in the normal pelage, agrees closely with the colored figure of Thomas & Wroughton's plate in its rich rufous-ochraceous coloring and clear bright rufous feet. This is a native skin without a skull, purchased from natives. The second specimen is melanistic, blackish brown all over minutely ticked above with paler. The two phases are shown in the colored plate referred to above.

Measurements. The Igale ♂ measured 320. 275. 60. 20 mm.

Diet. There were small cockchafer in its stomach.

Parasites. A tapeworm and species of nematode were present in its viscera.

HERPESTES ICHNEUMON FUNESTUS (Osgood)

Mungos ichneumon funestus Osgood, 1910, Publ. Field Mus. Nat. Hist., zoöl. ser., 10, no. 3, p. 17: Naivasha, Kenya Colony.

1 (M. C. Z. 27317) Madehani, Ukinga Mtns. ii. 30.

Native name. *Nyeretzi* (Kikinga).

Discussion. A flat skin remade from an entire skin which had been used as a bag, purchased from a native who stated that the mongoose had been killed in Madehani village.

ATILAX PALUDINOSUS RUBESCENS (Hollister)

Mungos paludinosus rubescens Hollister, 1912, Proc. Biol. Soc. Washington, 25, p. 1: Kilimanjaro, Tanganyika Territory.

♀ (M. C. Z. 26458) Mwaya, Lake Nyasa. 3. iii. 30.

Native name. *Mkekwa* (Kinyakusa).

Discussion. This single specimen of the marsh mongoose is smaller in skull measurements than any of those listed by Hollister, although

it is fully adult and sexed (perhaps wrongly) as a male. With a condylobasal length of 96 mm., it is much smaller than *A. p. mordax* from northwest of Lake Nyasa in which this measurement is 115 mm.; in *A. macrodon* of the Upper Congo Basin it is 108.8 mm. It may perhaps best be considered as representing *rubescens*.

Measurements. Alleged a "male" measuring 460. 320. 90 (with claws 95). 35 mm.

Enemies. Said to have been killed by a dog; this animal appeared to be in a somewhat diseased condition.

ICHNEUMIA ALBICAUDA GRANDIS (Thomas)

Herpestes grandis Thomas, 1889, Proc. Zoöl. Soc. London, p. 622: ? Limpopo or Zululand.

5 (M. C. Z. 26554-5, 27145-7) Ukerewe Id., Lake Victoria. 12-19. vi. 30:

Discussion. These five adults agree in their strikingly large size as compared with *I. a. ibcana* which at first they were taken to be. None of the series from Kenya Colony equals them in this respect, and I have no doubt, on account of the close coincidence of their measurements, that they represent Thomas's *Herpestes grandis*. This was based on a skeleton of a large White-tailed Mongoose, the exact origin of which was unknown, though it was believed to have been collected by T. E. Buckley either on the Limpopo or in Zululand, South Africa. I have found nothing further concerning this animal since its original description, so that the following notes may be acceptable. The color of the body is the same mixed gray and black seen in *I. albicauda ibcana* with a considerable admixture of black in the median area from nose to base of tail. The lower part of the legs, fore and hind, and the feet are uniform brownish black. The tail seems to be much less white than in the usual type of *albicauda*, only the terminal quarter being clear white, the basal three-quarters mixed black and white, most of its hairs having a long white base, followed by a black ring nearly as long, then a shorter white tip. The skulls are all longer than the maximum listed by Hollister in his table, but the supposed differential character mentioned by Thomas of a distinct metaconid on the last lower molar does not seem to hold; it may be present too in little-worn teeth of *H. albicauda ibcana*. The distinction, therefore, rests chiefly on size, but this is so very striking that *grandis* may be regarded as valid, though doubtless only in a subspecific sense.

Measurements. The field measurements are as follows:

Register no.	Head & body	Tail	Hind foot	Ear	Sex
26554	660 mm.	440 mm.	120 mm.	40 mm.	♀
26555	615 mm.	425 mm.	130 mm.	40 mm.	♂
27145	603 mm.	460 mm.	120 mm.	40 mm.	♂
27146	590 mm.	460 mm.	120 mm.	40 mm.	♂
27147	590 mm.	460 mm.	120 mm.	40 mm.	♂

The skull measurements follow, as well as those of the largest of the thirteen specimens listed by Hollister from Kenya Colony.

Register Number	Greatest length	Basal length	Palatal length	Zygomatic width	Upper cheek teeth	Lower cheek teeth
26554	—	—	65 mm.	—	43 mm.	48 mm.
26555	116 mm.	110 mm.	68 mm.	62 mm.	45 mm.	50 mm.
27145	112 mm.	106 mm.	66 mm.	58.5 mm.	43 mm.	48.5 mm.
27146	114 mm.	109 mm.	67 mm.	60 mm.	44.6 mm.	49 mm.
27147	115 mm.	109.5 mm.	68.5 mm.	61 mm.	45 mm.	49 mm.
U. S. N. M. <i>Ichneumia albicauda ibeana</i> (Hollister's largest).						
182346	110 mm.	—	—	56 mm.	43 mm.	47.8 mm

Diet. Grasshoppers and termites were present in the stomachs of three of the mongooses.

Parasites. Ticks (*Haemaphysalis leachii* and *Rhipicephalus* sp.) were present in their fur, tapeworms in their stomachs and linguatulids in the liver.

Habitat. All five were shot at night, mostly between 1 and 2 a.m. as they came trailing a meat bait which had been dragged for a mile along a path through the bush.

ICHNEUMIA ALBICAUDA IBEANA (Thomas)

H(erpestes) a(lbicaudus) ibeanus Thomas, 1904, Ann. Mag. Nat. Hist. (7), 13, p. 409: Athi-ya-Maui (i. e. Stony Athi Station), Kenya-Uganda Railway, Kenya Colony.

♀ (M. C. Z. 25836) Unyanganyi, Turu. 4. xii. 29.

Native names. *Saka* (Kinyaturu); *kananga* (Kikami).

Discussion. This identification is made with reserve as the mongoose is only half-grown and so unidentifiable by subspecific characters. This form is, however, known to occur a little to the east of Unyanganyi, and there seems to be no reason to doubt its identity with *ibeana*.

Measurements. ♀ 378. 290. 93. 35 mm.

Diet. Some insects, taken from its stomach, were preserved.

HELOGALE VICTORINA Thomas

Helogale victorina Thomas, 1902, Proc. Zool. Soc. London, p. 120: Nassa, Speke Gulf, Victoria Nyanza, Tanganyika Territory.

♀ (M. C. Z. 26531) Kikuyu, Ugogo. 23. xii. 29.

Native name. Sala (Chigogo).

Discussion. This single specimen from Kikuyu on the outskirts of Dodoma is similar to others from Tanganyika in the collection of the Museum of Comparative Zoölogy.

Measurements. ♀ 240. 120. 45. 20 mm.

MUNGOS MUNGO COLONUS (Heller)

Crossarchus fasciatus colonus Heller, 1911, Smithsonian Misc. Coll., 56, No. 17, p. 16: Southern Guaso Nyiro, Kenya Colony.

♂ (M. C. Z. 26530) Mwanza, Lake Victoria. 7. vi. 30.

3 (M. C. Z. 26526-8) Ukerewe Id., Lake Victoria. 12. vi. 30:

Native name. Nkala (Kisukuma).

Discussion. These specimens agree in their gray shoulders with Heller's description, and have shorter tails than the race *macrurus* of Ruwenzori. There is more or less variation of an individual nature in the amount of rusty color of the paler transverse bands.

Measurements. Two juvenile males from Mwanza and Ukerewe measure 210. 130. 50. 20 mm. and 240. 145. 55. 15 mm.

Breeding. In addition to the young males mentioned above three still smaller animals were brought to me alive on the twelfth and thirteenth; these represented two litters and show that May or early June is apparently the breeding season in this region.

Parasites. *Porocephalus* was present in the liver of an adult.

Habits. Though the three young alluded to above were from different litters, one animal being much smaller than the other two, yet one of the larger, from the very first, dissociated itself from its companions and exhibited an astonishing preference for human society. This threw the two weaker animals together and they were bullied by the friendly one whom we can call A. It was customary for A to snap at B and C and drive them from the dish of food until he had fed to repletion; also if anyone attempted to stroke B or C when A was in the vicinity, he would hurl himself upon them viciously. If the lid of their large and roomy cage was raised, A would leap and squeak or chirp, for he loved to be taken up and petted, his ears and

armpits rubbed, or his fur stroked forwards or backwards. He might be rolled on his back, pulled about by the tail or dragged along by a leg; no indignity could surprise him into an exhibition of bad temper.

A fortnight after receiving them I was camping at Entebbe and allowed them to roam at large — the sliding front door of their cage was propped up so that they could run back into it if alarmed. At Jinja also, they were allowed freedom for several hours a day, but one could not handle B and C for they would utter an explosive note and spring forward with a snap; one good bite upon my finger tip taught me caution and instead of lifting them back into their cage, they were shepherded home when it was desirable to fasten them up for the night. Then followed a week of travelling when they could not be allowed out. On board ship their cage was placed on the forward hatch (shaded when necessary) and A was permitted to roam at large daily. At first the cage was often surrounded by passengers whose sudden movements were at times a source of great alarm to B and C. There were, however, three boys on board who helped tremendously by playing with the mongooses for hours at a time. After four days at sea, C was gingerly lifted out and raced about in enjoyment of this freedom till she was scared by the wind blowing a hat along the deck and fled off the hatchway. I was fetched and after a little manoeuvring succeeded in retrieving her. On the morning of the eighth day at sea I lifted out the tame animals, but when B was approached he snapped as usual and after two attempts I desisted. Later in the day I returned and sitting beside the cage attempted to rub his ears. To my astonishment he crouched down and though evidently in great alarm, he submitted. After petting him for several minutes I quietly lifted him out of the cage and set him down outside. This was almost the last time that I had any trouble with him. The trio raced about the hatchway, stretched out in the sun, rolled over, biting each other in play; two coils of wire hawser were selected by them as their headquarters and refuge from both friends and fancied foes. In due course they arrived at their destination and were presented to the Zoölogical Society of London.

HYAENIDAE

CROCUTA CROCUTA GERMINANS (Matschie)

Hyaena (Crocotta) germinans Matschie, 1900, Sitzber. Ges. naturf. Freunde Berlin, p. 27: Lake Rukwa, Tanganyika Territory.

Folklore. An old Mnyakusa at Ilolo related to me the following rather foolish story of the hyena: A hyena said to his friend, "Wait a

moment and let me precede you, then look well and tell me if my figure is all right." His friend laughingly exclaimed, "No, very bad." Then the friend went ahead and the first hyena laughed at his appearance in the same way; in this manner they continued their nocturnal prowl, each in turn laughing at his companion's build and gait.

FELIDAE

ACINONYX JUBATUS NGORONGORENSIS Hilzheimer

Acinonyx guttatus ngorongorensis Hilzheimer, 1913, Sitzber. Ges. naturf. Freunde Berlin, p. 290: Ngorongoro, Tanganyika Territory.

1 (M. C. Z. 26467) Ipemi, Uzungwe Mtns. 7. i. 30.

Native name. *Dhambanyika* (Kihehe).

Discussion. In his discussion of the East African cheetahs, Hollister indicates slight differences that may be constant between those of northern and central Kenya and Tanganyika. It is still a question how far one may go in recognizing geographical races, for the material available for comparison is hardly representative enough. The fine specimen from the Uzungwe region agrees, however, with Hilzheimer's description of *ngorongorensis* in its pinkish buff sides and belly, lacking white below. Compared with a skin from Asia Minor in which the belly is part white, the black spots are much more numerous and larger. Since Hilzheimer's name has slight priority over Heller's *raineyi* and *velox* for the cheetahs of Kenya, I am using it in preference, especially since the description, though based on a menagerie specimen, seems to agree rather with our animal in the replacement of white by buffy below.

FELIS PARDUS SUAHELICA Neumann¹

Felis leopardus suahelicus Neumann, 1900, Zoöl. Jahrb. Syst., **13**, p. 551: "East Africa," specimens mentioned from Tanga, etc.

Diet, etc. Colobus (*Colobus polykomos sharpei*) and Mountain Duiker (*Cephalophus melanorheus lugens*) were found in the excrementa of leopards in the Nkuka Forest on Rungwe as was Blue Monkey (*Cercopithecus leucampyx moloneyi*); in addition intestines of this monkey were found in Ngosi Crater where this leopard abounds.

¹ Pocock (Proc. Zool. Soc. London, 1932, p. 558) has recently advocated that the name of this leopard should be *Panthera pardus fusca* (Meyer), since he is unable to distinguish it from the Indian race. Nevertheless, since the typical race *pardus pardus* intervenes between the range of the East African and the Indian forms, we prefer for the present to retain the name *suaelica* for the former, and to regard *Panthera* as a subgenus of *Felis*.

While I was camped on Rungwe a leopard carried off a suckling pig from the near-by Rungwe Mission, three miles below my camp in the forest. The pig was found lodged in the branches of a tree at a height of about twenty feet from the ground. Gun traps were set at the foot of the tree but the leopard ascended without disturbing the strings; in descending with the pig, however, it fired a gun which shattered the leopard's right forefoot. Later the leopard was located in a small hill close to the mission buildings; thither three of the staff went, Mr. Scharff armed only with a revolver. Without warning the leopard sprang upon him from quite short grass and, seizing his right arm above the elbow in its jaws, bore him to the ground by the suddenness of the impact, at the same time it prevented his making use of the revolver; the animal started to claw him and he rolled over to protect his face. Fortunately he was wearing a thick coat at the time which saved him but he received some quite unpleasant wounds nevertheless. Leaving him, the leopard attacked four natives in quick succession before it was killed by a shot from Mr. Staub's rifle. Mr. Scharff related the incident to me several days after it occurred.

On arrival at Njombe the District Officer — Mr. J. E. Seymour — related the following incident which, at my request, he was kind enough to write down for me. I was shown the claw marks of the leopard on the door of a cupboard in his lounge. Mr. Seymour's account follows: "We were just going to have dinner when our big dog (about the size of an ordinary foxhound) came into the room covered with blood and water. We presumed that he had gone to drink at the furrow and a leopard had attacked him. They had probably fallen into the water and the leopard had taken fright. The dog was in a pretty bad way but my wife bandaged him up. The next night when we went to bed we left the dog asleep in our lounge before a roaring fire which must have burnt all night. The front door was shut but the back door was open. During the night the leopard came in and seized the dog. Claw marks can still be seen on the tiled floor. The next morning we saw the tracks of the leopard leading to the thick bush near the river. During the day the spoor was followed and the remains of the dog were found. These were poisoned and though the leopard had another go at the carcass the next night it appears he got rid of the poison. The next night he again returned to the house where he clawed the meat safes on the back verandah and also tried to get into the kitchen where another dog had been locked up for safety. Though several gun traps were set the leopard was never caught." I might add that the kitchen door was clawed to a height of six feet.

FELIS CAPENSIS HINDEI Wroughton

Felis capensis hindei Wroughton, 1910, Ann. Mag. Nat. Hist. (S), 5, p. 205: Machakos, Kenya Colony.

♂ (M. C. Z. 25738) Saranda, Ugogo. 30. xi. 29.

Distribution. Native skins were also offered for sale at Dabaga, Madehani and Iloilo.

Native names. *Nulua* (Kihehe); *nyombe* (Kikinga); *injusi* (Kinyakusa).

Measurements. ♂ 850. 320. 95. 110 mm.

Diet. Mouse fur present in stomach but the animal decidedly emaciated.

Parasites. An enormous number of fleas (*Ctenocephalus felis* and *C. connautus*), a few ticks (*Rhipicephalus appendiculatus*), sixteen hippoboscids (*Hippobosca capensis*) were captured, while as many again escaped. Between the skin and the shoulders was a mass of tapeworms which Dr. J. H. Sandground informs us are a pseudophyllidean type and, to the best of his belief, constitute the first record of proliferating *Spharganum* larvae in Africa. He considers it probable that the animal contracted this infection through eating frogs or fish infested with an earlier larval stage of *Spharganum*. An Acanthocephalid and numerous other nematodes (*Toxocara mystax*, *Physaloptera praeputiale*, and *Prosthenorchis pardalis*) were present in the stomach.

Remarks. The encounter with this animal was so unusual that it seems worth recording. Accompanied by a native I had been following a baboon trail on which were cat tracks, down through the thickets which clothe the escarpment. On emerging from the undergrowth we saw many baboons which made off rather more slowly than usual but perhaps this was because I carried no firearms. They barked defiance as we came scrambling down the rocks. I halted for a moment to appreciate the scenery when my attendant exclaimed: "Look at that leopard," as he pointed to a tree thirty feet below upon whose base a serval crouched. On seeing us it slipped off and walked away, down the ravine, till it disappeared round a bend fifty yards away. We watched it in astonishment, my companion suggesting that it had been attacked by baboons, hence its inability to travel at a serval's customary speed. We followed, little expecting to see it again, but on rounding a rock, came suddenly upon it. The animal rose with a snarl and climbing ten feet farther up the side of the ravine collapsed beneath a bush. I climbed to within ten feet of it, then approached

within six. Having no gun I threw three stones: the first two cleared the bush but missed the serval which only snarled in response; the third struck it full on the forehead and stunned it, a blow from a stick finished it. There were no signs of its having been attacked by the baboons and I concluded that it had succumbed to heavy infestation by parasites which, perhaps, it might have been able to overcome but for the drought.

GALAGIDAE

GALAGO CRASSICAUDATUS ARGENTATUS Lönnberg

Galago argentatus Lönnberg, 1913, Ann. Mag. Nat. Hist. (8), **11**, p. 167: Ukina, near Shirati, Tanganyika Territory.

♂ (M. C. Z. 26877) Ukerewe Id., Lake Victoria. 16. vi. 30.

Native name. *Mulilalila* (Kikerewe).

Discussion. In Schwarz's (1931) review of *Galago*, this is recognized as a valid race of *G. crassicaudatus*, distinguished by its beautiful silvery gray pelage. He has also mentioned its occurrence on Ukerewe Island.

A second form, characterized by entirely black pelage, occurs upon the island and is probably but a melanistic phase of *argentatus*; though of distinctive appearance the natives do not distinguish it by a separate name.

Measurements. ♂ 320. 375. 55. 60 mm.

Habits. These galagos are extremely abundant in the dense thickets or bush which cover parts of the island. Even for galagos they are exceptionally noisy on moonlight nights; though they cry at sunrise and sunset they are fairly quiet till the moon is up, thereafter their strange cries "haahaa, wuurrk" and throaty growling resound on every side.

GALAGO SENEGALENSIS MOHOLI Smith

Galago moholi A. Smith, 1839, Illus. Zoöl. S. Africa, **1**, pl. lxxxviii bis: South Africa.

4 (M. C. Z. 26446, 26449-51) Madehani, Ukinga Mtns. 14-17. ii. 30.

Native name. Quite unknown to the natives of Madehani.

Discussion. Comparison of this small series with a specimen representing the South African *G. s. moholi*, shows no important difference, and Schwarz is doubtless correct in referring to this race the small

South African galagos from Tabora, Tanganyika Territory, southward. The series from the Uluguru Mountains that we previously identified doubtfully with *cocos*, are scarcely distinguishable and are perhaps nearer *G. s. braccatus*.

Measurements. The largest ♂ measured 140. 165. 50. 35 mm.; the largest ♀ 150. 190. 55. 35 mm.

Breeding. None of the specimens was in breeding condition.

Habits. One evening I heard the call of a galago within fifty yards of my tent; hurrying to the spot I caught a glimpse of two scurrying forms, one in a cypress, the other in a eucalypt, running to the forest. The following evening I posted myself at the spot just before dark and after a wait of ten minutes again heard the cry which immediately preceded the arrival of a galago which desired to cross from the tip of one branch to that of another in an adjacent tree. About ten appeared, of which I shot three, the rest going on into the forest. On the evening of the fifteenth and again on the sixteenth, I posted natives to watch from whence these galagos came. In this way we tracked three back to a mass of vegetation in a big tree not far from the forest edge. Next morning Salimu climbed to what was apparently a "nest" but only one galago came out. The "nest" was a natural assemblage of dead and decaying leaves into which the galago had burrowed. That evening I again watched with several natives at 6.20 p.m. (still daylight), the time when they usually appeared. None was detected, however, either because we had just had a heavy downpour which had left all the foliage dripping, or else because our attentions had scared them from the vicinity.

CERCOPITHECIDAE

CERCOPITHECUS LEUCAMPYX MOLONEYI Sclater

Cercopithecus moloneyi Sclater, 1893, Proc. Zoöl. Soc. London, p. 252, pl. 17: Karonga, Nyasaland.

♂ ♀ ♀ (M. C. Z. 26547, 26831-2) Kigogo, Uzungwe Mtns. 14-27. i. 30.

♂ (M. C. Z. 26829) Madehani, Ukinga Mtns. 18. ii. 30.

Skull & ♂ ♂ (M. C. Z. 27316, 26830, 27174) Nkuka Forest, Rungwe Mtn. 28. iii. 30.

Native names. *Dumbili* (Kihehe); *neri* (Kikinga); *indoweke* (Kinyakusa); *munzu* (Kimahausi).

Discussion. The type of *moloneyi* came from Karonga, at the north-west end of Lake Nyasa, so that the specimens from Madehani and

Rungwe are nearly topotypical. The Uzungwe series is quite the same. Selater's excellent figure, reproduced in Elliot's Review of the Primates, 2, pl. 6, shows the color characters very well.

Measurements. The largest ♂ (Madehani) measured 640. 820. 110. 40 mm.; largest ♀ (Kigogo) measured 555. 680. 130. 35 mm., and the young ♀ 255. 275. 82. 35 mm.

Breeding. The adult female shot at Kigogo on January 14 was nursing the young one.

Diet. At Kigogo these monkeys were disturbed when feeding upon the bamboos; the ground round about was littered with the broken and chewed fragments.

Parasites. Nematodes (*Oesophagostomum pachycephalum* and *Streptopharagus intermedius*) were both present in monkeys from the Nkuka Forest, the former only in the Kigogo monkeys.

Enemies. A Martial Hawk-Eagle (*Stephanoaëtus coronatus*), shot at Kigogo, held the bones of one of these monkeys in its stomach. In the crater of Ngosi Volcano we found the remains of a Moloney's Monkey with the intestines intact, evidently a recent leopard-kill. While we were examining it at 2 p.m., both blue monkey and colobus were barking or grunting away to our left, disturbed either by a leopard or eagle to judge by the uproar. Finger nails and fur were found in the excrement of a leopard in the Nkuka Forest, where these monkeys are much sought after by the Banyakusa who eat the meat.

Habitat. While I was sitting motionless in the Nkuka Forest one evening as night was falling, a large party of monkeys led by an old male, came into the surrounding trees and even right above my head. The trees were of small size, but one was rather larger than the rest and had been selected apparently as the resting place by the leader who "barked" loudly. The small monkeys arrived and passed into the surrounding trees in which they kept up a bird-like twittering; it was quite dark when I left them and they were still moving about and uttering cries of one kind or another. It seemed strange that they should be so noisy at such a time, advertising their resting place to any leopard that might be on the prowl.

CERCOPITHECUS AETHIOPS CENTRALIS Neumann

Cercopithecus centralis Neumann, 1900, Zoöl. Jahrb. Syst., 13, p. 533: Bukoba, west shore of Victoria Nyanza, Tanganyika Territory.

♀ (M. C. Z. 26481) Ukerewe Id., Lake Victoria. 18. vi. 30.

Native name. *Enkende* (Kikerewe).

Discussion. This skin and skull of an adult female are apparently quite typical.

Measurements. ♀ 460. 510. 110. 20 mm.

PAPIO ? NEUMANNI Matschie

Papio neumanni Matschie, 1897, Sitzber. Ges. naturf. Freunde Berlin, p. 181: Donyo Ngai, Tanganyika Territory.

♂ ♀ (M. C. Z. 26472-3) Ukerewe Id., Lake Victoria. 10 & 16. vi. 30.

Native name. *Enkobe* (Kikerewe).

Discussion. Two skins and skulls of immature animals from Ukerewe Island are presumably of this form, though it must be said that the distinction of the various named varieties of baboons from eastern Africa is still unsatisfactory. The skins show a greater proportion of tawny than of black in the pelage, the tails are untufted and somewhat grayer than the body. The hands and feet of one are deep black, with a few small, partly hidden tawny marks; of the other a nearly uniform mixture of tawny and black like the body.

Measurements. The ♂ measured 530. 380. 165. 60 mm.

Parasites. Many nematodes (*Physaloptera caucasia*) were present in the stomach of the male.

COLOBIDAE

COLOBUS POLYKOMOS SHARPEI Thomas

Colobus sharpei Thomas, 1902, Proc. Zoöl. Soc. London, p. 118: Fort Hill, Nyasaland.

Colobus polykomos sharpei Schwarz, 1929, Proc. Zoöl. Soc. London, p. 597.

♂ ♀ (M. C. Z. 26828, 27175) Fungwe Forest near Madehani, Ukinga Mtns. 17. ii. 30.

Distribution. Elsewhere this species was reported as present in the New Forest Reserve at Dabaga, and seen within and without the Ngosi Volcano Crater and in the Nkuka Forest, Rungwe Mountain, where guerezas are more abundant than in any other place visited by the collector.

Native names. *Imbega* (Kihehe, Kikinga and Kinyakusa).

Discussion. The type locality, Fort Hill, is near the northwest end of Lake Nyasa, hence the pair of colobus from near Madehani should represent this race which, however, is very close to *palliatu*s (whose

type locality is the coast opposite Zanzibar) differing only in larger size and in certain correlated skull characters.

Enemies. In the Fungwe Forest, three hours south of Madehani and near the northeast shores of Lake Nyasa, these guerezas are as shy as at Madehani; it took two hours of scrambling up and down very steep forest-clad hillsides before this pair was obtained. Half a dozen colobus skins were brought to the camps at Madehani, Nyamwanga and Rungwe and offered for sale; these were refused and the vendors professed entire ignorance of any contravention of game regulations in killing the animals. Doubtless they were primarily killed for food as the Wahehe, Wakinga and Banyakusa all eat colobus. The Wahehe make ingenious bag nets which are placed on the larger limbs of the tree — facing the trunk — in which the guerezas are sleeping. The animals sleeping in the top of the tree are then scared and as they run out along the limbs of the tree they are enveloped in the bags (which can be set one behind the other) and each bag drops from the branch, but remains attached by the cord which simultaneously closes the aperture; this results in the animal being suspended in the air, uninjured but imprisoned in the bag. The Banyakusa have a different method, they fell the trees adjacent to the one in which the guerezas are sleeping, then ascend the tree cutting off the branches as they go until the scared animals are at their mercy.

Colobus fur was found in the excrement of a leopard in the Nkuka Forest.

In this same forest a Martial Hawk-Eagle (*Stephanoaëtus coronatus*) was shot while engaged in eating a colobus; a second eagle flew away. Salimu, who shot the bird, brought back a hind leg of the colobus, a fully adult animal, which was in the talons of the eagle. A great many small maggots were present in what appeared to be talon marks on the limb, I should say that at least forty-eight hours had elapsed since the animal had been killed; it is obvious, however, that an eagle could not devour so large a monkey in one meal and would naturally return to the kill again and again.

One frequently hears a rippling cry of "cooe-cooe" oft repeated in the forest and while I declared it was made by a hawk, Salimu affirmed that it was a preliminary call of a colobus for it usually terminated with their hoarse, throaty growl; on one occasion he had stalked a tree from which the cry had come and found only an old colobus in it. Shortly after this argument, however, Salimu came upon an eagle in a tree actually giving the call of "cooe-cooe." He was manoeuvring for a shot when a big male colobus, uttering its harsh warning cry, rushed

up the tree to the eagle which flew off to an adjoining tree actually pursued by the colobus which caused it to take to wing again. Salimu said that the rest of the company of colobus were all crouching among the leafage on the big limbs of the first tree and so occupied in looking upwards that they failed to observe him below.

Habits. How persistently a colobus may remain concealed was well illustrated on another occasion when we were endeavouring to smoke, or drive, an alleged flying squirrel from the hollow trunk of a two-hundred-foot tall tree. After cutting and breaking down the saplings surrounding the tree, we spent half an hour in trying to light a smoky fire and in hammering on the tree-trunk. After this noisy period there followed a silence which appeared to be more trying to the guereza than the noise for to our great surprise, as we had not suspected its presence, it sprang from the tree.

These colobi are tamer in the Nkuka Forest than in any other place known to me. One afternoon a guereza returned to within sixty feet of me three times to take another look; evidently fearful, its curiosity overcame its fear. The interesting thing about the incident was the noise which it made as it departed, a noise which I had never before heard from a colobus; it was an explosive, sneeze-like sound which I can only compare to a noise frequently made by goats.

After spending the morning in feeding and wandering through the forest these guerezas often rest at noonday. On April 14 I was following a path up the mountain at 1 p.m. when I observed two guerezas taking a siesta in a tree on my left so that the animals were only sixty feet from me and quite unaware of my presence; this induced me to sit down and watch them. Presently a few drops of rain fell and one of the guerezas awaking, stretched out its left leg and scratched the left buttock very vigorously. I had not found any ectoparasites on any of the colobus collected, in fact Rungwe Mountain seemed to be too wet for fleas for not one was found on any mammal in this forest, despite the long series of squirrels secured. Having relieved the irritation to its satisfaction the colobus bent forward and commenced a minute inspection of the toes of its left foot, employing both hands to separate them; while engaged in this manner it leaned still farther forward and so caught sight of me from between its legs. With a single bound it landed in the next tree and running along a branch was soon lost to sight. Its companion, thus suddenly aroused from slumber, raised its head which had fallen forward upon its chest. For many seconds it made no further move, then suddenly bounded off in the same manner as the first.

COLOBUS BADIUS GORDONORUM (Matschie)

Piliocolobus gordonorum Matschie, 1900, Sitzber. Ges. naturf. Freunde Berlin, p. 186: Uzungwe (Udschungwe) Mtns, Tanganyika Territory.

Colobus badius gordonorum Schwarz, 1928, Zeitschr. f. Säugetierk., **3**, p. 95.

4 (M. C. Z. 2655-3, 26736) Dabaga, Uzungwe Mtns. 30. xii. 29.

Native names. *Nguluwa* or *kulula* (Kihehe).

Discussion. Two adult females and two youngish specimens were obtained at Dabaga in the Uzungwe range of southwestern Tanganyika to which this strikingly handsome form seems to be confined.

Matschie described this monkey as a distinct species in 1900 on the basis of an imperfect skin found in a native hut, and two other skins secured in the same region by the brothers von Gordon, for whom it is named. So local is this race that apparently no others had reached Europe when Elliot, in 1912, published his Review of the Primates; nor was it until 1923 that another specimen was recorded, when the first to be received by the British Museum was sent by Loveridge. Of this specimen Kershaw (1923) writes that the entire back from shoulders to tail is mostly red, but the skin is much worn. One of the adult females secured by Loveridge has the top of the head rufous bordered narrowly at the sides by black, and the entire back is deep shiny black with almost no admixture of red hairs even at the base of the tail. The fore limbs are black, the hind limbs black mixed with silvery. The tail is mixed black and ochraceous. The lower surfaces are white.

The skulls measure: greatest length 108.5, 105 mm.; condylobasal length 86.5, 85 mm.; palatal length 41, 41 mm.; zygomatic width 80, 76 mm.; width of palate outside molars 33, 34 mm.; width of brain case 61.5, 57 mm.; outside orbits 64.5, 61 mm.; maxillary tooth row ($c-m^3$) 35; mandibular tooth row ($c-m_3$), 38.

Of the two young, one is rather small, but both are coloured like the adult except that the tails show a variable amount of black.

The nearest relative of this handsome monkey is believed to be *C. kirki* of Zanzibar, and although regarded (and no doubt rightly) by Schwarz as merely a subspecies of *C. badius*, its present isolated position and striking color pattern seem to set it off well from others of the genus. Probably at some former time its distribution was more extended.

Measurements. The adult females measured 655. 685. 180. 35 mm. and 600. 640. 170. 35 mm., and a nursling male 170. 320. 100. 30 mm.

Breeding. Both adult females were nursing young when shot; it was impossible to see this at the time, as they were shot on the run.

Parasites. Nematodes (*Streptopharagus intermedius*) were recovered from the stomachs of these guerezas.

Enemies. The bodies were eaten by Wahehe porters.

Habitat. The forest where these animals were killed lay about three miles east or southeast of my camp and at an altitude of 5,000 feet. It was almost dusk when we came up with the troop and had to shoot the animals on the run and at a great height.

ANOMALURIDAE

?ANOMALURUS ORIENTALIS Peters

Anomalurus orientalis Peters, 1880, Monatsber. Akad. Wiss. Berlin, **45**, p. 164: "Zanzibar" probably Nguru Mtns., Tanganyika Territory.

Distribution. Shortly after my arrival in the Nkuka Forest on Rungwe Mountain, I learned that Mr. Scharff, one of the mission staff, had seen a flying squirrel in 1927, when the forest was being inspected with a view to cutting timber. During the twenty-six days of our stay I made repeated inquiries from natives as to the existence of such a creature, but it was not till the end of the third week that I met a man — a Mnyika — who declared that he had twice seen one of these animals during a lifetime spent in the forest. He completed the description quite accurately and added that he had never met anyone before who knew anything about the creature, even its name being unknown to him. From the description furnished by this man as well as by Mr. Scharff, it would appear that the flying squirrel of Rungwe Mountain is identical with, or closely related to, *A. orientalis* of the coastal mountains Uluguru, Nguru and Usambara.

That the animal is extremely rare is obvious for we made it the main object of our search during the best part of a week. At the base of a hollow tree of enormous dimensions — perhaps two hundred feet in height — and covered with parasitic growths, Salimu found some excrement which very possibly came from a flying squirrel. Both the tree and its situation, which was on the summit of a spur of the mountain, seemed just such as a flying squirrel would have chosen in the Uluguru Mountains; on the other hand the droppings may have been those of a red squirrel (*Acthoscirus lucifer*) for on two occasions one was disturbed in an adjacent tree. Whether the red squirrel lives in hollow trees instead of in a nest among the branches I cannot say, as no nests were seen in the forest during our stay; one would suspect that they build in hollow trees because of the continuous downpour.

SCIURIDAE

HELIOSCIURUS UNDULATUS RHODESIAE (Wroughton)

Funisciurus annulatus rhodesiae Wroughton, 1907, Mem. Lit. and Phil. Soc. Manchester, 51, pt. 2, art. 5, p. 15: Ndola, Northern Rhodesia.

♀ (M. C. Z. 26544) Kitungulu, Urungu. 15. v. 30.

Native name. *Kapali* (Kirungu).

Discussion. A single adult female from Kitungulu, near the south-east end of Lake Tanganyika, unquestionably represents *rhodesiae* and constitutes its most northeastern record. The exact relationships of this squirrel seem still uncertain. Major Ingoldby has recently advocated its close affinity to the small *gambianus* group of the western forest, listing it, however, as a distinct species, but these, although similar in pattern, seem to be smaller forms, and the thumb has its claw narrow and compressed, more like a functional claw, in contrast to the flattened nail-like claw on the thumb of *rhodesiae* and other East African Heliosciuri. Indeed, it appears to be much nearer *H. undulatus*, agreeing in the relatively long narrow tail with annulations, the shortened ear, and generally coarse ticking of its hair-pattern. The prominent short white lines, one above and one below the eye, are in *undulatus* of a deep ochraceous, and the clear white of the lower surface of the body and limbs is replaced in *undulatus* by a light rusty wash. Otherwise, however, and except for the slightly smaller size of *rhodesiae*, the two seem very similar, so that I have ventured to associate the latter with *undulatus* as a subspecies.

The skull of this specimen measures: greatest length 50 (48) mm.; basilar length 38 (36); palatal length 23; zygomatic width 29 (27) mm.; interorbital width 15 (14) mm.; upper molar row 10 (9) mm.; lower molar row 9.8 mm.; length of bulla 11.5 (11) mm. The measurements in parenthesis are those given for the type of *rhodesiae*. Those of our specimen are slightly larger, as was to be expected from the fact that the locality is intermediate between the area whence the type came, and the Kilimanjaro region where *undulatus* is typical.

A skin without a skull purchased from a native at Dabaga, Uzungwe Mountains, where the species is known as *kihindi* to the Wahehe, is perhaps an intermediate between *rhodesiae* and typical *undulatus*, with its undersurface light yellowish brown and the hind feet grizzled gray like the back, instead of rusty. As no living examples were seen at Dabaga it may be uncommon.

Measurements. ♀ 210. 250. 45. 16 mm.

HELIOSCIURUS MUTABILIS SHIRENSIS (Gray)

Macroxus shirensis Gray, 1867, Ann. Mag. Nat. Hist. (3), 20, p. 327: Shire River, Nyasaland.

4 (M. C. Z. 26442-5) Madehani, Ukinga Mtns. 13. ii. 30.

7 (M. C. Z. 26207-12, 26215) Nkuka Forest, Rungwe Mtn. 24. iii & 8. iv. 30.

1 (M. C. Z. 26541) Igale, Poroto Mtns. 25. iv. 30.

Native names. *Kiperemende* (Kikinga); *imbelemende* (Kinyakusa); *imbelembe* (Kinyika).

Discussion. In his recent paper on African squirrels, Major Ingoldby (1927) regards the race *chirindensis*, from Chirinda Forest of southeast Rhodesia, inseparable from typical *mutabilis* of Mozambique, leaving *shirensis* as the only other recognizable form of *mutabilis*, if this be regarded as a species distinct from the *undulatus* group.

The series of twelve specimens listed above is very uniform in dorsal coloration, an evenly mixed black, ochraceous and gray, in which the gray predominates. The hairs of the back are dark at the base, succeeded by a ring of dull ochraceous, then one of black, with a gray tip. In three from the Chirinda Forest the ochraceous element is much more marked, giving the back an obviously yellowish tone instead of gray. The cheeks are nearly clear gray, the tail has some sixteen or twenty black rings alternating with ochraceous, and overlain by the long white tips of the hairs. The lower surface of the body and limbs varies from nearly clear white with a line of buffy bounding the dorsal coloration, to a light buff which may be more intense on the hind legs.

Measurements. The largest ♂ measured 240. 270. 50. 15 mm.; the largest ♀ 250. 290. 50. 20 mm.; both are from Rungwe Mountain.

Breeding. No fetuses were found in any of the eight females.

Parasites. A flea (*Ceratophyllus infestus duratus* subsp. n.) was found on the Igale specimen.

Enemies. There was a great demand for the bodies by both Wakinga and Banyakusa who eat these animals.

Habits. It seemed a strange thing to me that after shooting two pairs of these squirrels on the day of our arrival at Madehani no more should be seen for ten days, though during the interval I shot ten examples of a new race of *byatti* and desisted from shooting more. Salimu, however, reported seeing two pairs feeding on wild fruit in a tree in the forest some two miles down the mountainside below our camp.

On February 23 I was sitting in my tent when I heard the familiar "kuwheking" call of *Aethosciurus byatti* and taking my field glasses I made my way to the forest edge. The "kuwheking" grew louder and noisier, though at intervals it was supplemented by a low growling note, an astonishing sound for a squirrel to produce. Suddenly another call broke out in a tree above, I can only liken it to the noise of someone tapping a nail with regularity, "peng-peng-peng"; at times this sound trailed off into a kind of squeak. Then I observed a squirrel descending a slightly sloping tree-trunk, approaching very slowly and with frequent pauses but continuously jerking its tail. This Shire Squirrel was within thirty feet before it saw me, and then, except for a start, stood its ground silently watching me, occasionally emitting its cry. All the time the angry "kuwheking" and growling continued very close to me until at last I discovered that the squirrel which was making the noise was between the trunks of two big trees which were growing from the same spot. This animal, a form of Byatt's Squirrel, was ten feet from me at most and only four feet from the ground. Suddenly it caught sight of me, stopped its cry and gazed spellbound for a matter of seconds; the next minute it vanished round the bole of one of these trees and then scampered away in the undergrowth. At this the Shire Squirrel bolted up its tree a further fifty feet or so but as I remained quiet, it began to descend; when it had come down to within forty feet I put the field glasses on it, watched it for some time and becoming tired at last, I turned away. The squirrel remained, head downwards on the trunk in the same exposed position and stared after me as I walked off. I thought the contrast in the behavior of the two animals was so remarkable that I wrote it down.

AETHOSCIURUS BYATTI BYATTI (Kershaw)

Funisciurus byatti Kershaw, 1923, Ann. Mag. Nat. Hist. (9), **11**, p. 592: Moshi, Kilimanjaro, Tanganyika Territory.

Aethosciurus byatti Kershaw, 1923, Ann. Mag. Nat. Hist. (9), **11**, p. 708.

8 (M. C. Z. 26533-9, 26203) Kigogo, Uzungwe Mtns. 12-30. i. 30.

Native name. *Sindikuleti* (Kimhansa).

Discussion. Although no topotypical Kilimanjaro specimens are available for comparison, yet the series previously collected by Loveridge on the Usambara and the Uluguru ranges to the south, were considered to be specifically identical by Kershaw, while Loveridge

and I in a later paper agreed that specimens in comparable pelage from the two ranges showed no tangible differences. The range of *byatti* therefore extends from the Kilimanjaro forests, southward more or less interruptedly on the two ranges mentioned to the Uzungwe Mountains in southwestern Tanganyika, where a series of eight in fresh unbleached pelage was collected at Kigogo in January. They all agree in the bright ochraceous color of the feet and the distinctly greenish tint of the fur. November skins from the Usambara range are a distinctly brownish shade, due apparently to bleaching. This squirrel seems to be closely related to *ruwenzori*, but is characterized by the less clearly defined white underparts, more rufous feet and forelimbs, and by the prevalence of white tips on the hairs of the distal four-fifths of the tail, which are apparently lacking in the distinctly banded tail of the Ruwenzori squirrels. For the present *byatti* may be regarded as a distinct species.

Measurements. The larger ♂ measured 200. 190. 50. 20 mm.; largest ♀ 225. 210. 50. 20 mm.

Habits. These squirrels are by no means common at Kigogo in such sections of the forest as I visited; moreover their habits made them far more difficult to collect than their relatives in the Uluguru and Usambara Mountains. When disturbed these latter usually sought refuge in the tops of the high forest trees and might be shot generally as they climbed, though in the Amani forests they often ascended out of gunshot range because the trees were so tall.

While a few of the trees in the Kigogo forest are of large size, the majority are small and I never saw Byatt's Squirrels more than twenty feet from the ground; usually they were at only half that height. At the slightest noise — and they were exceptionally alert — they would slip round to the reverse side of the trunk and descend to the ground where the tangle of undergrowth provided security and rarely afforded one the chance of a shot. Two other factors militated against the collector; at Kigogo these squirrels lacked that curiosity which causes so many members of the family to pause in flight for a moment to take a peep at the disturber of their peace, secondly their coloration renders them inconspicuous for practically all the tree trunks are heavily smothered in moss of a shade exactly like the body pelage while a pendant tail resembles one of the myriad trailing lichens.

AETHOSCIURUS BYATTI LAETUS subsp. nov.

6 ♂, 4 ♀ (M. C. Z. 26196-202, 26204-6) Madehani, Ukinga Mtns.
14-22. ii. 30.

Type. No. 26,198 Museum of Comparative Zoölogy. Adult ♂ skin and skull from Madehani, Ukinga Mountains, north end of Lake Nyasa, Tanganyika Territory. Collected by A. Loveridge, February 22, 1930.

Description. Similar to *A. byatti* but with muzzle and feet greenish ochraceous instead of rufous. Pelage long and full, the longest dorsal hairs about 19 mm. Entire upper surface from the nose to the tail and the basal inch or so of the latter a finely speckled olive green and black, the individual hairs black at base with a narrow subterminal ring of greenish yellow and a black tip. On each side of the muzzle is a patch of clear ochraceous extending, with some admixture of darker, to the area in front of and below the eye; forearms bright ochraceous, the hands and backs of the feet clear and slightly paler ochraceous in distinct contrast to the rufous tint of these parts in *byatti*; ankles and tibial region rusty, merging into the color of the back. A very small post-auricular patch of buffy. Chin and inguinal region greenish ochraceous; rest of the body below gray, the hairs mostly with slaty bases and dull whitish tips. Tail bushy, not tapering, the hairs of its distal four-fifths chiefly black above and below, with long white tips, and in addition a basal and often a central narrow band of buffy, which, however, does not produce a cross-barred effect such as is shown in Thomas and Wroughton's figure of *ruwenzorii*.

Skull. From the postorbital processes the temporal ridges continue backward in adults to meet at the occiput. The nasals are broad and extend back slightly beyond the level of the premaxillaries, their combined posterior border forming a bracket-shaped outline, with a median notch. At the sides the nasals are slightly pinched in with concave outline, and expand a very little distally.

Measurements. The field measurements of the type are: head and body 230 mm.; tail 200 mm.; hind foot without claw 50 mm., with claw 55 mm.; ear 20 mm.

The skull measurements are: greatest length 56 mm.; basal length 47 mm.; palatal length 27.5 mm.; nasals 17 mm.; zygomatic breadth 29.5 mm.; width outside molars 13.7 mm.; mastoid width 23 mm.; upper cheek teeth 10.5 mm.; lower cheek teeth 10.3 mm.

The largest ♂ measured 235. 265. 55. 20 mm., and the largest ♀ 235. 170. 50. 20 mm.

Discussion. This fine series of ten skins is from the northern end of Lake Nyasa, at a point which is apparently the most southerly known for this species, meeting and slightly overlapping the range of the very differently colored *A. lucifer*. It is noteworthy, however, that Loveridge did not actually find these two species occurring anywhere together, although it is possible that they may do so for *lucifer* extends its range well to the south.

Parasites. Fleas (*Ceratophyllus infestus duratus*) were plentiful on these animals.

Enemies. The bodies of these squirrels are in great demand for food among the Wakinga and the corpses of the above series were carried off as soon as skinned.

Habits. This species occurs in the same forest as *Heliosciurus mutabilis shirensis*, but is abundant while the latter is rare. Its cry "kuwhek-kuwhek" was indistinguishable from that of *byatti* at Kigogo. On February 18 I killed a pair with one shot as they were "kuwheking" to the accompaniment of jerking tails within six inches of one another. Another day, hearing the call being repeated with regularity, I crept in the direction of the sound and approached so softly that I was within three feet of the squirrel, which was in the grass, before it saw me. It was evidently intently listening to, or approaching, another animal which was calling about forty feet away. So startled was this squirrel that it dashed up the nearest tree, a bent-over sapling no thicker than a man's arm, which, as it was leaning in my direction, brought the animal to within six feet of, and level with, my head. I covered it with my gun automatically but did not fire for it would have resulted in blowing the creature to pieces. There we stood eyeing each other, neither moving, for a considerable time; finally I lowered the gun and immediately the squirrel was off like a flash, round the other side of a big tree and up to the very topmost branches far out of range. The difference in the conduct of Madehani squirrels as contrasted with those at Kigogo was noticed many times; while the latter sought refuge in the undergrowth the Madehani animals more usually ascended the trees.

AETHOSCIURUS LUCIFER (Thomas)

Xerus (Paraxerus) lucifer Thomas, 1897, Proc. Zool. Soc. London, pp. 430, 932, pl. 54 (colored): Kombe Forest, Masuku Range, 7,000 feet, Nyasaland.

16 (M. C. Z. 26180-95) Nkuka Forest, Rungwe Mtn. iii-iv. 30.

Native name. *Kasindi* (Kinyakusa).

Discussion. This beautiful squirrel is apparently of very local dis-

tribution in the forests at the northern end of Lake Nyasa. Its striking orange body and tail, with the black middorsal stripe, give it a very different appearance from any other African squirrel, yet it shows its relationship to the *Acthosciurus* group in the curiously greenish-yellow tint where the orange of the hind legs pales into the gray of their inner side.

Measurements. The largest ♂ measured 260. 190. 55. 20 mm.; and ♀ 230. 210. 50. 20 mm. The sexes are equally divided and all adult.

Breeding. None of the females was pregnant.

Parasites. No external or internal parasites were found.

Habits. I heard the cry of this squirrel shortly after our arrival in the forest; to me the call seemed indistinguishable from that of *A. b. byatti* and the animal seemed equally noisy; the cry "ku whek" was heard chiefly in the late afternoon; whether it was raining or fine appeared to make no difference.

When disturbed these animals make for the tops of the highest trees which are tall enough to be out of gunshot range. It might be supposed from an examination of their handsome orange-red pelts with conspicuous black dorsal patch, that these squirrels would be very obvious among the verdure of the rain forest. This, however, is far from being the case for on many of the trees is an epiphytic fern of exactly the same shade of orange-red, while the dark midribs of the ferns are very similar to the dark dorsal patch of the squirrel.

Folklore. The following story was related by an old Mnyakusa living outside the forest who said that these squirrels will enter the Banyakusa granaries in search of food. Once upon a time a hare, hearing that a squirrel was going to raid a granary, suggested that they should go together, a request to which the squirrel acceded. They entered by the door which was not properly closed and began to feed. The hare fed so noisily, however, that the owner heard and went to inspect the granary. As he appeared in the doorway the squirrel escaped through a small hole in the opposite wall. The hare endeavoured to follow but, being too large to get through, it was overtaken and killed by the man. Whether this seemingly pointless tale had some basis in fact or was purely folklore I cannot say.

PARAXERUS CEPAPI QUOTUS Wroughton

Paraxerus cepapi quotus Wroughton, 1909, Ann. Mag. Nat. Hist. (8), 3, p. 516: Katanga district, Belgian Congo.

♀ (M. C. Z. 26532) Kasanga, Lake Tanganyika. 16. v. 30.

Native name. *Kapale* (Kirungu).

Discussion. The single specimen from Kasanga in its pale mixed

gray coloration and white under parts, is almost a miniature of the *Heliosciurus undulatus rhodesiae* Wroughton from Kitungulu with, however, a slightly more ochraceous wash on shoulders and hindquarters. The type locality is the Katanga district of the southern Belgian Congo, considerably to the west of Kasanga across the lake, but the present specimen in its buffy, instead of white, hands and feet, seems to agree with this rather than with *P. c. soccatus* of the south end of Lake Nyasa (N. Angoniland) to which Wroughton says that "some specimens from the adjoining Nyasa-Tanganyika Plateau appear to belong." Possibly it is intermediate but suitable material for comparison is not at hand.

Two other specimens, collected in 1928 by Mr. F. G. Carnochan, extend the range of this bush squirrel northward to the vicinity of Tabora (Kewewe's and Mwanasomano's) in west central Tanganyika Territory. They seem to be identical in all respects with the Kasanga specimen.

Measurements. This fully adult ♀ measured 180. 165. 40. 15 mm.

Breeding. It was noted that the teats were enlarged.

Habitat. Shot in the dry scrub forest on the banks of Lake Tanganyika just south of the ruins of the old German fort and *boma*.

CRICETIDAE

DIPODILLUS HARWOODI LUTEUS Dollman

Dipodillus luteus Dollman, 1914, Ann. Mag. Nat. Hist. (8), **14**, p. 489: southern Guaso Nyiro, Kenya Colony.

♀ (M. C. Z. 26585) Dodoma, Ugogo. 23. xii. 29.

Native name. *Mbadya* (Chigogo).

Discussion. This specimen from Dodoma reflects in its pale buffy color above the desert conditions under which it lives. It is superficially similar to the pale *Leggada* from the same locality.

Measurements. ♀ 60. 74. 20. 10 mm.

Habitat. Taken about 8 p.m. when running about the road.

TATERA VICINA MUANSAE (Matschie)

Gerbillus (Tatera) vicinus muansae Matschie, 1911, Sitzber. Ges. naturf. Freunde Berlin, p. 333: Mwanza, Tanganyika Territory.

♂ (M. C. Z. 25690) Mangasini, Usandawi. 13. xii. 29.

Native name. *Bumbi gubara* (Kisandawi).

Discussion. A single very pale-buffy specimen, with black-tufted tail from Mangasini is practically identical with topotypes of *muansae*

from the southeastern end of Lake Victoria, indicating that this race covers an extensive area in western Tanganyika Territory. Farther east, it doubtless merges into the race *swaythlingi* which is only a little darker in the color of its dorsal surface as shown by topotypes in the collection.

Measurements. ♂ 155. 190. 36. 22 mm.

TATERA BÖHMI VARIA Heller

Tatera varia Heller, 1910, Smithsonian Misc. Coll., 56, no. 9, p. 1: Loletai Plains, southern Guaso Nyiro, Kenya Colony.

♂ (M. C. Z. 26578) Dabaga, Uzungwe Mtns. 2. i. 30.

4 (M. C. Z. 26486, 26489, 26579-80) Ukerewe Id. 10. vi. 30.

Native names. *Ingombwe* (Kihehe); *isagai* (Kikerewe).

Discussion. These large gerbils are readily distinguished by their very long tails which are white all round in the distal third, and mixed black and ochraceous dorsally on the basal two-thirds. The specimen from Dabaga has a slightly darker back than those from Ukerewe Island, due to admixture of more black hairs. As noticed by Hollister the immature examples are a nearly uniform buffy gray above until the development of the ochraceous-tipped hairs is complete.

The type locality of *böhmi* is Mpala, Marungu, west of Lake Nyasa and Thomas has recorded it from Fort Hill in the northern part of Nyasaland. The subspecies *varia* is apparently not very different but for want of comparative material, the Ukerewe specimens are tentatively referred to it.

Measurements. The largest ♂ in the Ukerewe series measured: 185. 245. 45. 20 mm.; ♀ 155. 210. 45. 20 mm.; the Dabaga ♂ 180. 220. 42. 25 mm.

MURIDAE

DENDROMUS MESOMELAS NYASAE Thomas

Dendromus nyasae Thomas, 1916, Ann. Mag. Nat. Hist. (8), 18, p. 241: Nyika Plateau, northern Nyasaland.

♀ (M. C. Z. 26612) Kigogo, Uzungwe Mtns. 24. i. 30.

22 (M. C. Z. 26230-51) Madehani, Ukinga Mtns. ii. 30.

Native name. *Nandalanendu* (Kikinga).

Discussion. This seems to be the common species of tree mouse at the head of Lake Nyasa but scarcer in the Uzungwe Mountains where only a single specimen was secured, while further comparison shows

that the specimen previously recorded by us from the Uluguru Mountains as *nigrifrons* True is in reality *nyasae*. Thomas named this more northern form of the South African striped-backed mouse on the ground of its slightly shorter tail and more tawny, less fulvous flanks. The tail length, however, is variable in the present series, ranging from 90 to 110 mm. in the flesh, whereas Thomas's measurement of 85 from the dried vertebrae in place is probably too small. The color of the under side though on the average whitish, the hairs of chest and belly slaty based, may be slightly washed with ochraceous buff, or this may be confined to a broad collar on the throat.

The type and one other specimen on which this race was founded came from the northern part of the Nyika Plateau at the northwest end of Lake Nyasa, where it seems to have been outnumbered by *D. nyikae* of the *Poemys* group. It may be added that although Thomas regards his *D. insignis* from Nandi, Kenya Colony, as a species distinct from *nyasae*, the two really differ in little but size, the latter with a skull length of 22.5 mm. against 25 mm. in the more northern animal.

Measurements. The largest ♂ and ♀ both measured 80. 100. 20. 15 mm.

Breeding. Nos. 26,244-51 are all immature. The presence in late February of so many half-grown young would seem to indicate that the breeding season is early in the year at Madehani.

DENDROMUS MELANOTIS NYIKAE Wroughton

Dendromus nyikae Wroughton, 1909, Ann. Mag. Nat. Hist. (8), 3, p. 248: Nyika Plateau, northern Nyasaland.

♀ (M. C. Z. 26613) Ukerewe Id., Lake Victoria. 11. vi. 30.

Discussion. This tree mouse from Ukerewe Island is the only example taken of the subgenus *Poemys*, characterized by a nail instead of a claw on the fifth hind toe. It is nearly uniform tawny above, with a faintly marked middorsal line, dusky ears, and an ochraceous wash over the otherwise white feet and belly. Its evident and close relationship to *melanotis* have induced me to regard it as a subspecies, differing in "rather smaller" size.

Measurements. This breeding ♀ measured 70. 80. 18. 16 mm.

Breeding. This mouse was brought in together with her nest and eight young by a native. The nest was constructed of very fine grasses. The mother died during the night, presumably having been injured in capture, and her nose was partly eaten away by ants

before morning. A litter of eight is apparently a large number for a mouse of this genus to produce.

Diet, etc. One young one died but the rest thrive on dry bread, potatoes, *mhoga*, etc. They were kept in a cage thickly carpeted with dry moss. An adult gerbil (*Tatera böhmi varia*) was introduced into their cage and to my astonishment the little tree mice took to sleeping with the big gerbil coiled round them; they invariably slept in a bunch and when disturbed might be taken up on one's hand without showing signs of great alarm. Within the week three young rats (*Mastomys coucha victoriorum*) were added to the party, then half a dozen full grown rats (*Arvicanthus abyssinicus rubescens*). I was afraid that the latter might do some injury to the wee mice, so a week later removed all but one of the *Arvicanthus*. The strangely assorted party of rodents then had a week of constant travelling and were none the worse, but had to be placed in a more suitable box instead of the glass-sided cage in which they had been living. On the night of July 8, i. e., four weeks after capture, they were left in Kilindini customs warehouse prior to embarkation next day. During the night the *Mastomys*, perhaps smelling all the good things with which they were surrounded, gnawed a hole in the side of the box and escaped, together with the *Dendromys*. The *Tatera* and *Arvicanthus* were too big for the hole and so remained, and in due course reached Europe. I mention this as it seems highly probable that the *Dendromys* will establish themselves upon Mombasa Island.

THAMNOMYS SURDASTER SURDASTER Thomas & Wroughton

Thamnomys surdaster Thomas & Wroughton, 1908, Proc. Zoöl. Soc. London, p. 550: Zomba, Nyasaland.

3 (M. C. Z. 26582-4) Dabaga, Uzungwe Mtns. 30. xii. 29.

2 (M. C. Z. 26660-1) Kigogo, Uzungwe Mtns. 16 & 22. i. 30.

2 (M. C. Z. 26262, 26407) Madehani, Ukinga Mtns. 20. ii. 30.

Native names. *Nyalutanda* (Kihehe); *tengela* (Kikinga).

Discussion. In this series of bush rats, the five from Uzungwe are very uniform in color of the back which is mixed ochraceous and black, giving a general dull yellowish brown, without the more rufous tints, but this is in part due to immaturity. The pair from Madehani are brighter, more rufous above, especially over the lower back and differ from all the other Tanganyika specimens examined in having the hind feet nearly pure white with a faint buffy tinge to the base of the metatarsus instead of having most of the foot buffy. Without

more specimens from the other parts of its range, however, the significance of the difference is not clear.

Measurements. The largest ♂ (Madehani) measured 125. 265. 25. 20 mm.; the largest ♀ (Kigogo) 125. 156. 25. 20 mm.

Breeding. A native youngster brought in a nest at Madehani on February 20, which held a female measuring 111. 164. 26. 18 mm., and two suckling young (preserved in alcohol), that measured ♂ 60. 55. 15. 7 mm., and ♀ 55. 45. 15. 8 mm.; these measurements, of which the adult and one young were taken by myself, tend to show that the very elongate tail is a more recent adaptation to arboreal life. The nest was almost spherical and a rat was seen to leave a similar nest which had been placed in a low thorny tree in a gloomy spot near the forest edge; the situation of the nest was about eight feet from the ground.

THALLOMYS DAMARENSIS SCOTTI Thomas & Hinton

Thallomys scotti Thomas & Hinton, 1923, Proc. Zool. Soc. London, p. 494: Junction of Thika and Tana Rivers, Kenya Colony.

♂ ♀ (M. C. Z. 26484-5) Kikuyu, Ugogo. 26. xii. 29.

Discussion. These very beautiful black-masked tree rats were obtained in the dry thorn-bush country a few miles outside Dodoma and seem to agree perfectly with the description of *scotti* from Kenya Colony. The type of the genus is *T. nigricauda* of which *loringi*, described from Lake Naivasha, is a subspecies, and Thomas has described several other "species" from southwest Africa. Apparently, however, these various forms may be resolved into two (or perhaps at most three) species, typified by *nigricauda* larger and darker with the white hairs of the ventral side more or less slaty at their bases, and a smaller, buffier species, typified by *damarensis*, in which the hairs of the lower side are snowy white throughout to their bases. The black eye mask is a striking color marking, but appears to be somewhat variable, perhaps more reduced in the latter group. The contrastingly gray forehead, cheeks and flanks and the tendency to develop a whitish mark at the back of the ear, are also characteristic. As our specimens fall into the second group, they are provisionally regarded as a race of *damarensis*. Their capture apparently constitutes the first record for Tanganyika Territory, and the field notes corroborate other testimony as to the tree-living habits of the genus.

Measurements. ♂ 135. 160? 25. 20 mm.; ♀ 145. 160. 25. 20 mm.

Habits. On Christmas eve I was sitting in my tent when three rats

dropped in a bunch from the acacia tree overhead. Though they must have fallen ten feet they immediately rushed to the tree and disappeared. Later I saw them, silhouetted against the sky, actively running about in the branches but the sprays of the branches were too thick to make shooting possible. On Christmas day I told Salimu about them and remarked that if he wished to give me an Xmas present to secure these rats for me before we left. Next morning, after he had packed the last tent, and I was upon the lorry superintending the stowing of the last loads, shouts broke out around the tree — Salimu had introduced a wand into the hollow trunk of the acacia and poked out the rats from its base; he had grabbed one rodent and was chasing the other. Presently he approached me, a rat in either hand, and said, "Here is your Christmas present!" One of the creatures had bitten deeply into his finger but he never paid much attention to such wounds. I dressed it with iodine and it healed rapidly.

RATTUS RATTUS KIJABIUS (J. A. Allen)

Mus kijabius J. A. Allen, 1909, Bull. Amer. Mus. Nat. Hist., **36**, p. 169: Kijabe, Kenya Colony.

♂ ♀ (M. C. Z. 26576, 26578) Dabaga, Uzungwe Mtns. 1. i. 30.

♂ ♀ (M. C. Z. 26324-5) Ilolo, Rungwe district. 26. iii. 30.

♂ ♀ (M. C. Z. 26492-3) Ukerewe Id., Lake Victoria. 10. vi. 30.

Native names. *Ngosuwu* (Kihehe); *imbewa* (Kinyakusa); *imbeba* (Kikerewe).

Discussion. Hollister has indicated that the form of *Rattus rattus* common in eastern Africa is "certainly not typical of true *rattus* of northern Europe or of the subspecies *alexandrinus* of the Mediterranean shores of Europe and northern Africa." He has therefore used J. A. Allen's name *kijabius* for it, and regards *Mus mwanzae* and *M. rattiformis* of Matschie as synonyms. The several specimens listed above are very uniform in appearance and are undoubtedly all one form to which the name *kijabius* may be applied. The adults are dark grayish brown, with a buffy tint due to the mixture of many black hairs with others having a gray base, a narrow subterminal ochraceous ring and a minute black tip. On the sides of the body the ochraceous becomes paler, buffy and with less black, while the belly is clear gray washed with buffy. The feet are dark and there is often a small white fleck in the middle of the chest.

Measurements. The largest ♂ (Dabaga) measured 180. 200. 35. 25 mm.; and largest ♀ (Ukerewe) 155. 142. 130. 24 mm.

Diet, etc. On the night of December 30 I was disturbed a couple of times by a rat in my tent which was pitched in the bush half a mile from the nearest farm. The following night again I heard a noise and flashing my torch in the direction of the sound saw a rat's tail disappear behind a box; in the morning it was found that two skins of *Lophuromys a. aquilus* and one of *Thamnomys s. surdaster* had disappeared but were eventually found six feet away. While the arsenically treated skins were undamaged, the attached skull of one *Lophuromys* had the brain eaten out and the skull of *Thamnomys* had wholly disappeared. Two traps were set on the night of the 31st and baited with bread. At 12.30 p.m. I rose and found that the bait of both had been taken and one trap sprung though I had not heard any sound. I reset both after baiting with corned beef. Just before 5 a.m. I was awakened by one trap being sprung, the bait had been taken from the other without setting off the break-back wire. Beside the trap which was sprung was a large rat — temporarily stunned — I aimed a blow at it but it sprang past me and ran for a couple of feet before collapsing, when I killed it with another blow.

Enemies. Rats of this race were recovered from the stomachs of an Underlined Sand Snake (*Psammophis subtaeniatus*) and Puff Adder (*Bitis arietans*) at Mangasini.

Folklore. An old Mnyakusa at Ilolo related the following story which savours much of Aesop's fables. A lion was accustomed to bask daily upon a large rock and was lying stretched out in the sun one day when a rat, which had repaired to the spot for the same purpose, mistaking the lion for a boulder, ran over him and settled to sun itself upon the lion's shoulder. The lion, awakening, called out, "Who are you so small that you are running over my back with your dirty feet? If I were to eat you I should still be hungry for you would be lost between my teeth when I attempted to chew you." The rat replied, pertly, "Big as you are and think yourself, yet you are not so strong as I." The lion roared at this rejoinder and the rat scampered off.

Some while afterwards the lion visited a byre and in endeavouring to get at the cattle he put his head in a snare which the herdsman had set for such as he. Half choked he roared and coughed by turns. The rat, hearing the commotion, said to himself: "Whatever is the matter that he is making such a commotion?" Being curious, he ran to the place and seeing at a glance what was amiss he ran up the lion and gnawed at the rope till the lion was free. Thus he demonstrated that he was stronger than the lion. After the rescue they shook hands (or paws) and became friends again.

PRAOMYS TULLBERGI JACKSONI (De Winton)

Mus jacksoni De Winton, 1897, Ann. Mag. Nat. Hist. (6), **20**, p. 318: Entebbe, Uganda.

♂ (M. C. Z. 26424) Mabira Forest, Uganda. 1. vii. 30.

Discussion. This adult male from beneath the thatch of a fallen hut in a banana plantation on the outskirts of the Mabira forest at a point forty miles west of Jinja, Uganda, is almost a topotype of the race *jacksoni* and is contrastingly browner than the very dark form from southwestern Tanganyika Territory described below.

Measurements. ♂ 130. 145. 25. 20 mm.

Parasites. Two fleas and a larval mite in its fur escaped preservation.

PRAOMYS TULLBERGI MELANOTUS subsp. nov.

1 (M. C. Z. 26498) Kigogo, Uzungwe Mtns. 24. i. 30.

11 (M. C. Z. 26259, 26387-94, 26411, 26497) Madehani, Ukinga Mtns. 19-28. ii. 30.

8 (M. C. Z. 26285-92) Nyamwanga, Poroto Mtns. 17. iii. 30.

1 (M. C. Z. 26293) Ilolo, Rungwe district. 26. iii. 30.

3 (M. C. Z. 26295-7) Nkuka Forest, Rungwe Mtn. 17. iv. 30.

Native names. *Nandalanendu* (Kikinga); *imbingi* (Kinyika); *imbewa* (Kinyakusa).

Type. No. 26,287 Museum of Comparative Zoölogy. Adult ♂ skin and skull from Nyamwanga, Poroto Mountains, northwest end of Lake Nyasa, Tanganyika Territory. Collected by A. Loveridge, March 21, 1930.

Description. A very dark, saturated race: general color above, including muzzle to eyes, the forehead, ears and central area of the back, dark blackish brown, many of the hairs entirely black, others with minute subterminal ochraceous rings that are barely noticeable; on the sides of the face and body and on the nape, these rings are longer, producing a dull rufous to ochraceous wash over these areas. Lower surfaces dull grayish white, the hairs everywhere with slaty bases. The tail, which equals the head and body in length, is blackish all around, with narrow rings, between which come out minute blackish-brown hairs, scarcely visible except with a lens. The feet are very dark smoky brown, with silvery toes, slightly mixed with duller on the hind feet.

The skull is of the usual slender narrow type, with long narrow nasals terminating in a slightly notched transverse line on a level

with the posteriormost extension of the premaxillaries; the incisive foramina just reach the level of the front edge of the molars instead of penetrating to the level of the anterior third of m^1 . Although Hollister regarded the East African forms as subspecies of *tullbergi* of the Cameroons, it seems quite probable that they are instead a distinct species, *jacksoni*, differing in the larger ears with consequently larger auditory bullae, and having the outer cusp of the first transverse lamina in the upper m^1 well developed instead of obsolete.

Measurements. The field measurements of the type are as follows: head and body 120 mm.; tail 120 mm.; hind foot 25 mm.; ear 25 mm. The largest pair in the Nyamwanga series measured: ♂ 125. 130. 23. 20 mm.; ♀ 112. 124. 24. 19 mm.

The skull of the type measures: greatest length 29.0 mm.; basal length 23.9 mm.; palatal length 14.3 mm.; incisive foramina 5.5 mm.; zygomatic width 13.2 mm.; breadth of brain case 12.0 mm.; upper tooth row 5.0 mm.; lower tooth row 4.8 mm.; across molars 5.4 mm.

Discussion. This race is closely related to *P. jacksoni* (type locality, Entebbe) and the subspecies *delectorum* (type locality, Mlanje, southern Nyasaland). It differs noticeably from both, however, in its extremely dark appearance, a series looking nearly blackish in most lights, while *jacksoni* is a distinctly ochraceous animal and *delectorum*, though somewhat darker, differs in the decided rusty wash of the forehead and fore back, while both *jacksoni* and *delectorum* have white hands instead of dark with whitish fingers. The extremely saturated appearance of this new race is doubtless to be correlated with the abundant moisture and rainfall of the area it inhabits among the mountains at the head of Lake Nyasa. In this connection, comparison has again been made with the skins from the Uluguru Mountains previously referred to *delectorum*. Although these are a shade darker above than a topotype of the latter, they are not very different and in their white feet and slightly rusty foreheads, are closer to it than to *melanotus*, and on the whole may be referred to *delectorum* until a more thorough knowledge of the variation shown by specimens from the intermediate area is available.

Breeding. At Madehani, on February 21, a native brought me a female rat together with four well-grown young. I noticed that the mother had four pairs of nipples.

Habitat. The female and young had been killed in a wheat granary. Wheat-growing was introduced by missionaries and wheat is now the staple article of diet among the Wakinga who build granaries — rather resembling big beehives of the skep type on stilts — in which

to protect their grain from rats. I was surprised to learn that the common rat (*Rattus r. kijabius*) was not present at Madehani. Most of the Madehani series were taken in snap-back rat traps baited solely with ground-nut butter and set at the forest edge. That the rats emerge to feed shortly after darkness falls I ascertained by visiting the traps at 8 p.m., a necessary procedure where ants are so numerous. At Rungwe a rat was taken in a trap baited with meat.

HYLOMYSCUS WEILERI (Lönnerberg & Gyldenstolpe)

Rattus (*Praomys*) *weileri* Lönnerberg & Gyldenstolpe, 1925, Ark. for Zoöl., 17, B, No. 5, p. 3: Burunga, western foothills of Mt. Mikeno, eastern Belgian Congo.

1 (M. C. Z. 26499) Kigogo, Uzungwe Mtns. i. 30.

8 (M. C. Z. 26406, 26409-10, 26412-6) Madehani, Ukinga Mtns. 24. ii. 30.

Discussion. A single adult from Kigogo and the series of eight rats from Madehani, adult and immature, are provisionally placed under this species, with the description of which they agree. They are small long-tailed tree rats, having but six mammae, and in comparison with *H. denniae* are shorter-haired and much duller colored, lacking the bright ochraceous tints; instead they have a dark brownish back minutely ticked with buff which is clearer along the sides of head and body. The feet are a little shorter and the skull is smaller with a shorter rostrum than in *denniae* which in a general way they appear to considerably resemble. The immature animals are much darker through lack of the buffy-tipped hairs, which in adults give a buffy tint to the entire dorsal surface. The hind feet average about 20 mm. in length against 22 or 23 mm. in *denniae* and the tails also are a few millimetres shorter, usually 125 to 140 mm.

Here should be mentioned that in our former paper on "Mammals from the Uluguru and Usambara Mountains, Tanganyika Territory," five specimens of a *Hylomyscus* from Vituri were erroneously included with *Praomys delectorum*. These, although a trifle less dark above, are clearly the same as the Madehani *Hylomyscus*, bearing about the same relation to the latter as the specimens of *Praomys* from those mountains do to the very little darker series which we have named *melanotus* from the mountains north and northwest of Lake Nyasa. This *Hylomyscus* then has a somewhat extensive range from the Lake Kivu country south to the Livingstone Mountains and eastward in forest areas to the Uluguru Mountains near the east coast.

Measurements. The largest ♂ measured 80. 110. 20. 20 mm.; and largest ♀ 80. 140. 20. 20 mm.

Habits. After being completely defeated by the galagos moving their quarters I took up a position at sunset one evening to watch the lacework of branches at the forest edge as silhouetted against the sky. Presently I saw a small animal running along the twigs of a tree, pause for a moment at its tip, then take a leap, worthy of a galago, which landed it in the twigs of the next tree. A minute or two later it was followed by a second, while at intervals others arrived until I had counted eight, most of which may have been *Claviglis*. I heard squeaking in the tree from which they had come, a typical rain-forest giant, smothered in lianas and tree ferns of several species. These formed a dense mat around every branch.

The following morning Salimu essayed to climb the tree but its girth, combined with the slipperiness of its bark, prevented him. Nothing daunted he climbed thirty feet up the perfectly smooth stem of an adjacent tree whose top leaned against the forest giant. Incidentally on descending three hours later he offered twenty cents to anyone who could climb this tree. Only one of the half-dozen natives present took up the challenge and, failing, he came sliding down to the accompaniment of a chorus of jeers from his companions.

When about forty feet up Salimu discovered the well-worn trail I had told him to look for; before he could ascend farther, however, it was necessary to dislodge a great mass of ferns and moss together with a quantity of dead leaves which had accumulated among the fronds of the former. As this matted growth crashed to earth a number of dormice sprang from it — at least five I should think. I was alone below and regret to say that all escaped. I was sure that my helmet covered one but on raising the helmet found the dormouse gone. I searched in the neighbouring grass and caught it by the tail but the tip came off and the rodent was fifty feet up a tree in a moment; fortunately I was able to shoot it without damage. I returned to camp for a couple of boys, a saw, axe, ball of string, etc. Having drawn up the saw Salimu cut off branch after branch and as they crashed to earth we rushed to examine them. Two more dormice were secured in this way but so nimble were the little creatures in ascending adjacent trees that I should not care to say how many we lost.

Salimu then set about methodically stripping the branches of their parasitic growths, working downwards towards the main stem. In doing so he dislodged eight rats, all of which we captured. If others escaped we were not cognizant of it. They were certainly not nearly as nimble and active as the dormice.

HYLOMYSCUS STELLA KAIMOSAE (Heller)

Epimys alleni kaimosae Heller, 1912, Smithsonian Misc. Coll., 59, no. 16, p. 7: Kaimosi, Kenya Colony.

♂ ♂ ♀ ♀ (M. C. Z. 26420-3) Mabira Forest, Uganda. 1. vii. 30.

Discussion. Through the kindness of Dr. Remington Kellogg of the United States National Museum, we have had topotypes of this forest mouse for comparison and they are identical with the above series from the Mabira Forest which lies to the west of Kaimosi. Their small size and bright ochraceous color, with somewhat darker mid-dorsal area are distinctive.

Measurements. All in the series were uniform in size, viz. 80. 125. 16. 15 mm.

Habitat. Five of these tree mice were found in a much decayed, but still standing, tree trunk; one escaped.

MASTOMYS COUCHA VICTORIAE (Matschie)

Mus (Epimys) microdon victoriae Matschie, 1911, Sitzber. Ges. naturf. Freunde Berlin, p. 342: Mwanza, Tanganyika Territory.

21 (M. C. Z. 26294, 26298-308, 26315-21, 26323) Iloilo, Rungwe. iii. 30.

2 (M. C. Z. 26494-5) Igale, Poroto Mtns. 29. iv. 30.

3 (M. C. Z. 26500, 26512, 26515) Kitungulu, Urungu. 14. v. 30.

4 (M. C. Z. 26490-1, 26512-3) Ukerewe Id., Lake Victoria. vi. 30.

Native names. *Imbewa* (Kinyakusa); *puela* (Kirungu); *imbcha* (Kikerewe).

Discussion. A series of multimammate mice representing *Mastomys coucha* was secured from the above localities mostly lying between Lakes Nyasa and Tanganyika. They seem to be indistinguishable from those taken on Ukerewe Island in Lake Victoria, which is undoubtedly the same as Matschie's *victoriae* from the adjacent shore, and I have therefore referred them all to that race provisionally. It may be that these are not sufficiently different from *M. coucha microdon* from the Zambesi to be separable, but adequate material for comparison is not at hand. They are readily told from the race *ugandae* by their clear gray bellies, lacking the brownish wash of the latter. The immatures are a dark gray above, hardly lightened by the buffy tint which becomes well developed, especially along the sides, in the adults.

Measurements. The largest ♂ (Ilolo) measured 164. 125. 25. 18 mm.; and ♀ (Ukerewe) 140. 125. 25. 20 mm.

Breeding. The Kitungulu specimens consist of a ♀ and a pair of young, each of which measures 70. 52. 16. 7 mm.

Parasites. Nematodes (*Arduenna* sp. and *Protospiura muricola*) were recovered from the stomachs of Ilolo and Ukerewe specimens respectively, while mites were also found in the fur of a rat from Ukerewe Island.

LEGGADA TRITON MURILLA Thomas

Leggada triton murilla Thomas, 1910, Ann. Mag. Nat. Hist. (8), 5, p. 91: Machakos, Kenya Colony.

3 (M. C. Z. 26507-9) Dabaga, Uzungwe Mtns. 28. xii. 29.

2 (M. C. Z. 26510-1) Luvuna, Uzungwe Mtns. 9. i. 30.

6 (M. C. Z. 26501-6) Kigogo, Uzungwe Mtns. i. 30.

3 (M. C. Z. 26404, 26260-1) Madehani, Ukinga Mtns. ii. 30.

1 (M. C. Z. 26313) Ilolo, Rungwe district. 26. iii. 30.

Native names. *Bunda* (Kihehe); *sesi* (Kinyika); *imbewa* (Kinyakusa).

Discussion. This large, gray-bellied, pygmy mouse is widely distributed in East Africa, from Machakos in Kenya Colony, southward and westward. The series includes adults and immature individuals, the latter less bright in color than the former.

Measurements. The largest ♂ (Kigogo) measured 70. 50. 15. 11 mm.; and largest ♀ (Ilolo) 85. 55. 16. 10 mm.

LEGGADA BELLA INDUTA Thomas

Leggada induta Thomas, 1910, Ann. Mag. Nat. Hist. (8), 5, p. 89: Molopo, northern Bechuanaland.

♀ (M. C. Z. 26521) Ludilo, Uzungwe Mtns. 8. i. 30.

♂ ♀ (M. C. Z. 26522-3) Nyamkolo, Lake Tanganyika. 10. v. 30.

♂, 3 ♀ (M. C. Z. 26517-20) Kitungulu, Urungu. 15. v. 30.

♀ ♀ (M. C. Z. 26524-5) Albertville, Lake Tanganyika. 21. v. 30.

Native name. *Kuzuru* (Kirungu).

Discussion. Apparently adults of this pygmy mouse are less easy to obtain than immature examples. The series of nine, old and young, is very uniform in color with dark median dorsal area, more russet sides than the brighter russet of typical *L. bella*. It appears to represent the subspecies described by Thomas from northern Bechuanaland.

Measurements. The larger ♂ (Nyamkolo) measured 46. 45. 10. 8 mm.; and ♀ (Albertville) 65. 50. 15. 10 mm.

Breeding. The Ludilo specimen was found beneath a hollowed log where it had its nest; this was about five inches in diameter and was composed of loosely woven dry grasses, coarser outside and fine and soft at the centre. The log was lying on rubbish-strewn ground on the outskirts of a village. The Kitungulu series consists of a mother and three young which I dug from a village rubbish heap; no nest was seen. The young male measured 40. 30. 13. 10 mm. and the two young females 50. 40. 13. 10 mm.

Habitat. The Albertville mice were taken beneath a bundle of grass and a sheet of galvanized iron respectively.

LEGGADA GERBILLUS spec. nov.

♂ (M. C. Z. 26586) Dodoma, Ugogo. 23. xii. 29.

Type. No. 26,586 Museum of Comparative Zoölogy. An adult ♂ skin and skull from Dodoma, Ugogo, Tanganyika Territory. Collected by A. Loveridge, December 23, 1929.

Description. A very pale species with a conspicuous pure white area below and behind each ear.

Above, from base of whiskers to tail, as far ventrally as a line about a millimetre below the eye, and excluding the free part of the fore leg, a clear "warm buff," darkened by admixture of blackish hairs over a very narrow median area that is darkest on the crown and ends in a point on the forehead at the level of the eyes. The clear buff of the sides extends down the outer side of the hind limb to the ankle. Lips, lower cheeks, entire fore legs, belly and hind feet, as well as a conspicuous ring from the inner base of the ear around the posterior side of the outer base, pure white to the roots of the hairs. Tail thinly clad with very minute appressed hairs which are dark brown above and whitish below.

The skull compared with that of *L. bella* is obviously shorter in the rostrum with wider incisive foramina, which penetrate between the tooth rows not quite to the level of the antero-internal tubercle of m^1 . The palate is more prolonged, so that the median posterior border is a millimetre behind the level of the last molars. The masseteric knob is prominent and about halfway back on the zygomatic plate instead of near its anterior edge. The upper incisors curve strongly backward at their tips. The audital bullae are obviously smaller.

Measurements. The field measurements of the type specimen are practically those of *L. bella* but the tail is shorter: head and body 55 mm.; tail 35 mm.; hind foot 13 mm.; ear 10 mm.

The skull measures: greatest length 17.0 mm.; basal length 14 mm.; palatal length 9.6 mm.; incisive foramina 3.5 mm.; zygomatic width about 9 mm.; across m^1 4.5 mm.; upper tooth row 3.4 mm.; mandible (condyle to tip of incisor) 11.2 mm.; lower tooth row 2.2 mm.

Discussion. Of this little mouse only a single specimen was secured, but after careful comparison with specimens and descriptions I am quite unable to reconcile its characters with any of them, so have regarded it as a new species, probably of the *bella* group, but different in the proportions of the skull, length of palate, and position of masseteric knob. Its almost uniform clear buffy coloring, only slightly darkened on the median line, and the conspicuous white area surrounding the back of the ear, give it at first sight quite the appearance of a pygmy gerbil or immature *Steatomys*. In other specimens of the group available the white spot below the ear is either absent or very inconspicuous.

Habitat. Taken running about the road on outskirts of town about 8 p.m.

CRICETOMYS GAMBIANUS VIATOR Thomas

Cricetomys gambianus viator Thomas, 1904, Ann. Mag. Nat. Hist. (7), 13, p. 413: Likangala, Nyasaland.

5 (M. C. Z. 26452-5, 26542) Nkuka Forest, Rungwe Mtn. iii-iv. 30.

Distribution. This pouched rat also occurs in native gardens at Madehani, Ukinga Mountains.

Native names. *Benga* and *akabenga* (Kinyika and Kinyakusa).

Discussion. This subspecies of giant rat ranges from the Southern Lake Region to Mozambique. With increasing age, the white of the underside is replaced by a dull buffy tint across the chest and upper abdomen.

Measurements. The only ♂ measured 340. 380. 70. 40 mm.; the largest ♀ 380. 375. 75. 40 mm.

Breeding. There were no fetuses in any of the four females but one taken on April 14 appeared to be nursing young.

Parasites. Orthopteran parasites (*Hemimerus nanseni*) and a flea (*Ceratophyllus infestus duratus*) were collected from one of these rats.

LOPHUROMYS AQUILUS AQUILUS (True)

Mus aquilus True, 1892, Proc. U. S. Nat. Mus., 15, p. 460: Mt. Kilimanjaro, 8,000 feet, Tanganyika Territory.

- 3 (M. C. Z. 26622-4) Dabaga, Uzungwe Mtns. 30. xii. 29.
- 10 (M. C. Z. 26627-36) Kigogo, Uzungwe Mtns. i. 30.
- 2 (M. C. Z. 26263, 26385) Madehani, Ukinga Mtns. ii. 30.
- 2 (M. C. Z. 26328, 26378) Nkuka Forest, Rungwe Mtn. iii-iv. 30.
- 1 (M. C. Z. 26625) Igale, Poroto Mtns. 29. iv. 30.
- 1 (M. C. Z. 26626) Ukerewe Id., Lake Victoria. 11. vi. 30.

Distribution. A damaged specimen was brought to me at Nyamwanga.

Native names. *Nyakihuku* (Kihehe); *kursi* (Kikinga); *nguya* (Kinika); *imbewa* (Kinyakusa); *imbeba* (Kikerewe).

Discussion. Although the above series shows more or less variation in color, they can be matched in every respect by specimens from Mt. Kenya which, as Hollister has shown, are really inseparable from typical *aquilus*, although regarded by Dollman as distinct under the name *zema* (type from the Aberdare Range, Kenya Colony). The latter author has given the name *rita* to a slightly redder race from the Katanga, but there seem to be no grounds for regarding any of the present series as different from *L. aquilus*.

Measurements. The largest ♂ measured 140. 75. 20. 20 mm.; largest ♀ 135. 85. 20. 20 mm., both from Dabaga.

Breeding. Two of four females trapped at Kigogo on 24. i. 30 held fetuses; one held two measuring 45. 18. 8. 4 mm., the other three measuring 52. 20. 10. 5 mm.

Habitat. It was noted that at both Madehani and Nkuka these rats were diurnal and were successfully trapped with meat bait. The tails of this species are very apt to be reduced to a mere stump, presumably through fighting among themselves; many were rejected on this account.

LOPHUROMYS SIKAPUSI ANSORGEI De Winton

Lophuromys ansorgei De Winton, 1896, Proc. Zoöl. Soc. London, p. 607, pl. 27: Kavirondo, Lake Victoria, Kenya Colony.

- 4 (M. C. Z. 26376-7, 26379, 26384) Madehani, Ukinga Mtns. 19-22. ii. 30.

Native name. *Kursi* (Kikinga).

Discussion. The four specimens listed above were the only ones secured and it is interesting to note that Madehani is the only locality

where both this species and *L. a. aquilus* were found together, for their general areas of distribution overlap. Typically *L. sikapusi* is the species of the West African forest area, while the speckled *L. aquilus* is characteristic of eastern Africa. Considering the amount of individual variation shown in these mice, there is surprisingly little difference between those of central and western Africa. Externally the Madehani series is not distinguishable from two skins from Liberia considered to represent *sikapusi* whose type locality is the Gold Coast, but specimens from the Cameroons seem to average a little darker above. De Winton named *ansorgei* from Kavirondo, Victoria Nyanza, distinguishing it from *sikapusi* by its "rather larger size and much darker colouring," but with more specimens for comparison these differences seem very small indeed. I have, therefore, used the name in a subspecific sense until a more thorough revision can be made. It seems obvious that Matschie's *L. sikapusi mantoufeli* from Mwanza, Victoria Nyanza, based on an imperfect specimen in alcohol, is a synonym.

Measurements. The largest ♂ measured 115. 65. 22. 16 mm.; the only ♀ 95. 65. 20. 15 mm.

Dict. Trapped with meat bait during the day, the trap being set at the forest edge.

DASYMYS ? HELUKUS Heller

Dasymys helukus Heller, 1910, Smithsonian Misc. Coll., **54**, p. 2: Sirgoit, southeast of Mt. Elgon, Kenya Colony.

♂ (M. C. Z. 26663) Dabaga, Uzungwe Mtns. 2. i. 30.

♀ (M. C. Z. 26659) Kigogo, Uzungwe Mtns. 17. i. 30.

♂ ♀ (M. C. Z. 26360, 26408) Madehani, Ukinga Mtns. 20. ii. 30.

♂ ♀ (M. C. Z. 26312, 26322) Ilolo, Rungwe. iii-iv. 30.

♀ (M. C. Z. 26662) Igale, Poroto Mtns. 24. iv. 30.

Native names. *Ikumba* (Kihehe); *ngerule* (Kikinga); *imbewa* (Kin-yakusa).

Discussion. This small series from five different localities in southwestern Tanganyika is quite uniform in general appearance, a dull mixed reddish brown and black above, paling to ochraceous and black lined on the sides, and a curious shade of whitish below, faintly tinged with light olive buff. They are nearly indistinguishable from *D. helukus* of the plateau to the southeast of Mt. Elgon, and are provisionally placed with that animal in the absence of comparable specimens of *incomtus* which comes from much farther south (Natal), or of the Congo races.

The shape of the skull is quite characteristic with the curiously depressed nasals, pinched together at their tips, the strong sharp interorbital ridges, and the deep palatal gutter continuous from the incisive foramina to the hind margin of the palate. A small series from the Lualaba River seems to be closely similar.

Measurements. The largest ♂ (Ilolo) measured 172. 151. 31. 19 mm.; the largest ♀ (Madehani) 172. 151. 31. 19 mm.

Breeding. A female, only 150 mm. in head and body length, was brought in at Ilolo on April 17, together with three nestlings, whose eyes were still unopened. The nestling ♂ measured 70. 50. 18. 10 mm., and the ♀ ♀, 60. 55. 18. 10 mm.

PELOMYS FALLAX INSIGNATUS Osgood

Pelomys fallax insignatus Osgood, 1910, Ann. Mag. Nat. Hist. (8), 5, p. 276: Fort Hill, Nyasaland.

♂ (M. C. Z. 26311) Ilolo, Rungwe. S. iv. 30.

♀ (M. C. Z. 26657) Tukuyu, Rungwe. 21. iv. 30.

Native names. *Siangi* (Kinyakusa).

Discussion. Of these two specimens, from localities only ten miles apart and situated in southwestern Tanganyika Territory, both agree in the lack of a dark dorsal line and in the coarse nature of the pelage, but the male is much the paler, almost golden, becoming very little rufescent at the base of the tail, and white below with faintly gray bases to the hairs. The female is much darker and has the whole fore part of the chest strongly ochraceous buff.

Measurements. ♂ 140. 140. 35. 20 mm.; ♀ 160. 155. 32. 20 mm.

Enemies. The female was caught and presented by a cat.

ARVICANTHIS ABYSSINICUS RUBESCENS Wroughton

Arvicanthis abyssinicus rubescens Wroughton, 1909, Ann. Mag. Nat. Hist. (8), 4, p. 358: Kibero, Unyoro, Uganda.

12 (M. C. Z. 26361-72) Entebbe, Uganda. 27. vi. 30.

Native names. *Imbeba* (Kinyoro); *mesi* (Luganda).

Discussion. The dozen specimens from Entebbe represent the form common in Uganda west of the Nile, about the northwestern end of Lake Victoria. They are characterized by their dark blackish color with a reddish wash over the back. This is often due to fading for in

fresh pelage the paler portions are more nearly ochraceous. A trace of the dark median line can usually be made out.

Measurements. The largest ♂ measured 175. 115. 30. 20 mm.; the largest ♀ 160. 130. 30. 20 mm.

Breeding. The largest ♀ held six embryos measuring 36 mm. in head and body; 15 mm. tail; 7 mm. hind foot; the ears were folded and too small to measure in the field.

ARVICANTHIS ABYSSINICUS MUANSAE (Matschie)

Mus (*Epimys* ?) *muansae* Matschie, 1911, Sitzber. Ges. naturf. Freunde Berlin, p. 340: Mwanza, Tanganyika Territory.

♂ ♂ ♀ (M. C. Z. 26619-21) Mwanza, Lake Victoria. 6. vi. 30.

Native name. *Imbeba* (Kikerewe).

Discussion. These three topotypes of the race *muansae* are interesting to compare with their close relative, *neumanni*, of which a series was also secured near the type locality. The latter is a very pallid animal, with almost clear buffy-white sides, while those from Mwanza are appreciably darker with a faint suggestion of a dorsal line and with darker sides. How distinct it may be from the more northern races, the material at hand is insufficient to show.

Measurements. ♂ 135. 100. 25. 15 mm.; ♀ 120. 100. 25. 15 mm.

Enemies. Another of these rodents was recovered from the stomach of a Brown House Snake (*Boaedon lineatus*).

ARVICANTHIS ABYSSINICUS NEUMANNI (Matschie)

Mus neumanni Matschie, 1894, Sitzber. Ges. naturf. Freunde Berlin, p. 204: Burungwe, near Irangi, Tanganyika Territory.

7 (M. C. Z. 25691, 93, 25700, 03, 05-07) Unyanganyi, Turu. 5. xii. 29.
10 (M. C. Z. 25692, 94-99, 25701, 02, 04) Mangasini, Usandawi. 12. xii. 29.

Discussion. This series of seventeen skins, consisting of nine males and eight females, comes from localities which are a comparatively short distance west or southwest of the type locality, Burungwe. They are very uniform in their pale appearance, and show no trace of the dark median line.

Measurements. The largest ♂ measured 130. 115. 25. 15 mm.; and ♀ 135. 130. 25. 15 mm.

LEMNISCOMYS STRIATUS MASSAICUS (Pagenstecher)

Mus (Lemniscomys) barbarus var. *massaicus* Pagenstecher, 1885, Jahrb. Hamburg Wiss. Anst., 2, p. 45: Lake Naivasha, Kenya Colony.

♀ (M. C. Z. 26614) Ukerewe Id., Lake Victoria. 16. vi. 30.

♀ (M. C. Z. 26382) Mabira Forest, Uganda. 1. vii. 30.

Native name. *Imbeba* (Kikerewe).

Discussion. Considering the abundance of this species in some localities, it is rather noteworthy that the above-listed rats were the only ones secured. Although rather pale like *macculus*, it has the large hind foot of the *striatus* group.

Measurements. The larger ♀ (Ukerewe Id.) measured 130. 145. 25. 16 mm.

RHABDOMYS PUMILIO DIMINUTUS (Thomas)

Isomys pumilio diminutus Thomas, 1892, Proc. Zool. Soc. London, p. 551: Mianzini, east of Lake Naivasha, Kenya Colony.

13 (M.C.Z. 26599-611) Dabaga, Uzungwe Mtns. xii. 29-i. 30.

12 (M.C.Z. 26587-98) Kigogo, Uzungwe Mtns. i. 30.

1 (M.C.Z. 26867) Tandala, Ukinga Mtns. 11. ii. 30.

4 (M.C.Z. 26863-6) Madehani, Ukinga Mtns. 15. ii. 30.

3 (M.C.Z. 26271, 26282, 26287) Nyamwanga, Poroto Mtns. 17. iii. 30.

11 (M.C.Z. 26272-80, 26284) Ilolo, Rungwe. iii. 30.

Native names. *Nyagalla* (Kihehe); *bunga* (Kikinga); *malamala* (Kinyakusa and Kinyika).

Discussion. There is considerable variation in color in the above series, but this is apparently a matter of age or individuality. The two pale dorsal stripes may be nearly whitish or rather gray like the sides, and the amount of yellowish wash on the shoulders and sides varies in intensity. Two old adults are rather paler than the rest of the specimens. The ears in this species are conspicuous by their contrasting rusty color with a small intensely black spot covering the proectote (outer anterior portion).

Measurements. The largest ♂ measured 135. 75 (missing tip). 20. 12 mm.; and largest ♀ 120. 100. 20. 15 mm.

Parasites. Nematode worms (*Arduenna* sp.) were found in a Dabaga rat.

Enemies. At Igale, Poroto Mountains, one of these rats was recovered from the stomach of a Puff Adder (*Bitis arietans*).

OTOMYS PERCIVALI Dollman

Otomys percivali Dollman, 1915, Ann. Mag. Nat. Hist. (8), **15**, p. 168: Lake Olbollossat, Naivasha district, Kenya Colony.

12 (M. C. Z. 26645-53, 26655-6, 26664) Dabaga, Uzungwe Mtns. xii. 29-i. 30.

8 (M. C. Z. 26637-44) Kigogo, Uzungwe Mtns. 14-31. i. 30.

Native name. *Gudi* (Kihehe).

Discussion. This fine series from the Uzungwe Mountains corresponds in every detail to Dollman's description of *O. percivali*, itself probably a close relative of *O. jacksoni* from Elgon, and perhaps only subspecifically different. It is of large size, and externally resembles *O. tropicalis*, but has coarser fur and is considerably paler in its general ochraceous tint, heavily lined with black. The ochraceous band on the dorsal hairs is paler and wider than in *tropicalis*. The skull is obviously arched in profile, with prominent raised ridges over the eyes, and strongly depressed rostrum. The lower incisors have two deep grooves, the last upper molar has seven laminae, the first lower molar four. The nasal bones are of the usual spatulate form, but do not exceed 7.5 mm. in combined width. Nearly all of the series are adult or approximately so.

This species has apparently not been found hitherto except at the type locality, twelve miles south of Lake Olbollossat, Naivasha district, Kenya Colony. The present record is, therefore, a considerable extension of the known range, to the southern part of the Tanganyika Plateau, and perhaps marks its southward limit.

There seems to be something of particular interest in the local distribution of the species of this genus. The above series from two localities in the Uzungwe Mountains and the species following were the only examples of the genus collected on the present trip. In 1922, however, one of Mr. Loveridge's trained collectors secured two of the very large *O. angoniensis classodon* between Iringa and Dabaga. Of the similar but smaller species *O. nyikae*, nothing was found, nor of the *O. tropicalis* group, which is mainly of more northern distribution. On the present expedition, at Madehani, at the north end of Lake Nyasa, none of these species was found, but instead a good series of an undescribed form.

Measurements. The largest ♂ measured 215. 85. 23. 15 mm.; and largest ♀ 170. 95. 25. 20 mm.

Parasites. Nematodes (*Willecomia* sp.) were found in the stomach of a Kigogo Swamp Rat.

OTOMYS (ANCHOTOMYS) ANCHIETAE LACUSTRIS subsp. nov.

- ♀ (M. C. Z. 26654) Dabaga, Uzungwe Mtns. 2. i. 30.
♀ (M. C. Z. 26359) Tandala, Ukinga Mtns. 11. ii. 30.
14 (M. C. Z. 26344-51, 26353-8) Madehani, Ukinga Mtns. ii. 30.
♀ (M. C. Z. 26326) Ilolo, Rungwe district. 31. iii. 30.
♂ (M. C. Z. 26658) Igale, Poroto Mtns. 30. iv. 30.

Native names. *Gudi* (Kihehe); *nuke* (Kikinga); *mbewa* (Kinyakusa); *sogo* (Kinyika).

Type. No. 26,358 Museum of Comparative Zoölogy. Adult ♀ skin and skull from Madehani, Ukinga Mountains, north end of Lake Nyasa, Tanganyika Territory. Collected by A. Loveridge, February 21, 1930.

Description. With the general characters of *O. anchietae* of western Angola, but smaller and less brightly colored.

Head and body above dark blackish brown, with a ferruginous cast due to the mixture of long black hairs with hairs having a narrow subterminal rusty ring and a black tip. The tint is very even over the whole upper surface of the head and body and on the cheeks and sides. Backs of the ears and feet blackish brown, sparsely clad with minute blackish hairs. Tail long and slender, blackish, thinly clad with minute blackish hairs that do not conceal the scales, its lower side a very little paler. Ventral side of body and limbs, slaty with a wash of ochraceous across the chest and upper abdomen.

The skull has a slightly depressed rostrum, with broadened spatulate nasals contracting behind as in most of the species north of the Zambesi, raised supraorbital edges extending back as usual to form a marked supraorbital angle, and thence across the middle of the parietals. The combination of a single deep external groove on the lower incisors, the possession of five distinct transverse laminae on the first lower molar and seven on the last upper molar, suffice at once to place this in the subgenus *Anchotomys* (Thomas, 1918, Ann. Mag. Nat. Hist. (9), 2, p. 208), to which at present only the single species *O. anchietae* is relegated.

Measurements. The field measurements of the type are as follows: head and body 175 mm.; tail 100 mm.; hind foot (with claws) 30 mm.; ear 20 mm. Those of the largest paratypes, both from Madehani, are: ♂ 185. 100. 30. 25 mm.; ♀ 180. 110. 30. 25 mm.

The skull of the type measures: greatest length 40 mm.; basal length 35 mm.; palatal length 20 mm.; zygomatic width 20 mm.; mastoid width 15 mm.; interorbital width 4.6 mm.; width outside

molars 7.5 mm.; nasals 14.8 x 7 mm.; upper cheek teeth (alveoli) 8.6 mm.; lower cheek teeth (alveoli) 8.5 mm.

Discussion. The eighteen specimens from four mountain ranges as listed above, appear to be the first of this Angolan subgenus to be discovered in the lake region, the Dabaga specimen carrying the range unexpectedly towards central Tanganyika Territory. While agreeing precisely in the peculiar combination of tooth characters shown by *O. anchietae* (type locality Kakonda, western Angola), these are uniformly smaller, the hind foot measuring 30 against 37 to 40 mm. in the latter, and the skull not exceeding 40 mm. instead of reaching 50 in total length; other external measurements are proportionately less (head and body in *anchietae* 240 mm., tail 120 mm.).

The coloration, also, to judge from descriptions is less intense. In general outward appearance this swamp rat is very different from the *tropicalis* group of eastern Africa, differing in its darker, richer coloration and especially in the long, slender tail, dark all around, and clothed scantily with more minute blackish hairs. In these respects it shows so close a resemblance to *O. kempi* from the Kivu region, that the two are hardly distinguishable externally. Indeed, it seems likely that *O. kempi* and *O. denti* really form with *O. anchietae* a group of very closely related species which should constitute the subgenus *Anchotomys* but so plastic are the characters of molar lamination and incisor grooving, that a classification based on these alone does not bring out the true relationship. If this interpretation be correct, *O. anchietae* extends across Africa from Angola to central Tanganyika on the south edge of the forest area, as a species with 5-laminated first lower molar and a 7-laminated last upper molar, while north of it in the Kivu region and again in the Uluguru Mountains of eastern Tanganyika its place is taken by *O. kempi* with 4-laminated first lower molar and 6-laminated last upper molar. Still farther north, in Ruwenzori East, comes *O. denti* in which the last upper molar is reduced to 5 laminae. Dollman has pointed out that in the two last species, the single groove of the lower incisors divides the tooth into an inner broader and an outer narrower section, the latter of which is nearly always the paler. This condition is less characteristic of the new subspecies, but obtains in about fifty per cent of the Madehani series and perhaps further emphasizes their relationship. Altogether this forms an interesting addition to the mammal fauna of Tanganyika Territory.

GRAPHIURIDAE

CLAVIGLIS MURINUS ISOLATUS (Heller)

Graphiurus murinus isolatus Heller, 1912, Smithsonian Misc. Coll. 59, no. 16, p. 3: Mt. Umengo, Taita Mountains, Kenya Colony.

♀ (M. C. Z. 26581) Dabaga, Uzungwe Mtns. 2. i. 30.

Native name. *Mderi* (Kihehe).

Discussion. This single specimen from the forests of Uzungwe is indistinguishable externally from *C. m. saturatus*, in its dark smoky coloration, which merges gradually into the slightly paler underside, faintly washed with buffy. Hollister has shown, however, that the audital bullae are smaller, and this is true also of the Dabaga specimen, which thus extends the recorded range of this race over three hundred miles to the southwest of those localities in southeastern Kenya and Mt. Kilimanjaro, whence he reports its occurrence.

Measurements. ♀ 84. 80. 15. 12 mm.

CLAVIGLIS SOLEATUS COLLARIS subsp. nov.

♂ ♂ ♀ (M. C. Z. 26373-75) Madehani, Ukinga Mtns. 24. ii. 30.

Native name. *Ulengera* (Kikinga).

Type. No. 26,373 Museum of Comparative Zoölogy. Adult ♀ skin and skull from Madehani, Ukinga Mountains, north end of Lake Nyasa, Tanganyika Territory. Collected by A. Loveridge, February 24, 1930.

Description. A medium-sized dormouse resembling *soleatus* of Mt. Ruwenzori and *raptor* of Mt. Kenya in the close buffy-gray fur above, the dark feet with white toes, and relatively large ears. It differs from both, however, in having the lower surface of the throat, chest and belly washed with pale ochraceous, which forms a more conspicuous buffy band across the lower throat.

Entire dorsal surface of body a buffy gray, the pelage consisting of hairs with slaty bases and a short ochraceous tip, sometimes with a very minute terminal point of black; among these are scattered all-black hairs but not enough to cause a darkening of the coloration on the middle area of the back as in *C. microtis*. A slightly dusky area just in front of each eye but not reaching to the muzzle and not extending as an ocular ring. Tail drab all around, ears dusky. Hands white, only slightly clouded on the wrist, but the feet with the entire metatarsal area dark brown, the toes white. The upper lips

buffy whitish, chin white; entire lower surface of body slaty gray, many of the hairs minutely tipped with ochraceous giving a pale-buffy wash over the gray, which is so much developed across the lower throat as to give a buffy collar. The type has, abnormally, a tuft of white hair at the back of the elbow, perhaps as the result of a wound.

Skull. The skull measures: greatest length 25.0 mm.; basal length 20.6 mm.; palatal length 10.0 mm.; zygomatic width 14.0 mm.; mastoid width 12.1 mm.; upper cheek teeth 4.0 mm.; lower cheek teeth 3.4 mm.; width across upper molars 5.5. mm.

Measurements. The field measurements of the type are as follows: head and body 90 mm.; tail 60 mm. but tip missing; hind foot 15 mm.; ear 15 mm. A ♂ measured 80. 45 but tip missing. 15. 15 mm.

Discussion. Hollister, in reviewing the specimens of this genus in the United States National Museum (see Bull. U. S. Nat. Mus., no. 99, p. 152, 1919), regarded *saturatus* and *raptor*, both of which occur on Mt. Kenya, as subspecies of *murinus*, supposing *raptor* to be the high-level representative, for it occurs near the upper limit of forest. Topotypes of *raptor*, however, show that in its dorsal coloration, of an even buffy gray, and in its shorter closer fur, as well as in the greater extent of dark color on the hind feet, it is of a quite different type and is undoubtedly a distinct species, the first-named form of which is probably *solcatus* of the eastern valleys of Mt. Ruwenzori, 5-6,000 feet. The Kenya representative is apparently very similar and both have the belly gray washed with whitish. This race from the Livingstone Mountains differs in its buffy-tipped hairs below, which form a more or less marked collar.

Habitat. A full account of the taking of these dormice will be found under *Hylomyscus weileri*, both rodents being found among the epiphytic growths of a giant forest tree.

PEDETIDAE

PEDETES CAFER DENTATUS Miller

Pedetes cafer dentatus Miller, 1927, Proc. Biol. Soc. Washington, 40, p. 113: Dodoma, Tanganyika Territory.

♂ (M. C. Z. 25988) Dodoma, Ugogo. 23. xii. 29.

Discussion. This topotype of the race *dentatus* is a fully adult male, but does not have quite such large incisors as the type, so does not bear out well this racial character attributed to it. The cranial measurements follow, with the corresponding ones of the type in

parenthesis: median upper length 85.3 (88) mm.; condylobasal length 72.2 (77) mm.; palatal length 38.7 (41) mm.; median length of nasals 31.5 (31.6) mm.; zygomatic width 53.5 (57) mm.; interorbital width 34.3 (38) mm.; width across bullae 41.5 (45.6) mm.; combined breadth of nasals anteriorly 14 (15) mm.; posteriorly 20.5 (22.8) mm.; alveolar frontal depth 33.7 (36.2) mm.; maxillary tooth row 19 (21.4) mm.; combined breadth of upper incisors at cutting edge 9.5 (10.6) mm.; of lower incisors at cutting edge 8.5 (9.4) mm.

Measurements. ♂ 410. 400. 125. 75 mm.

Parasites. Nematodes (*Trichocephalus* sp.) were found in its stomach.

Habitat. I visited the warren of springhaas just south of the station at 8 p.m. and saw two pairs of eyes by the light of the torch attached to my gun; bagged one with the first shot but the second animal decamped and though we waited in darkness for half an hour, no other springhaas appeared. We set five traps in the entrance of the burrows: four were sprung but no hares taken as they are powerful enough to wriggle out of these humane wire traps.

BATHYERGIDAE

CRYPTOMYS HOTTENTOTUS WHYTEI (Thomas)

Georychus whytei Thomas, 1897, Proc. Zool. Soc. London, p. 432: Karonga, Lake Nyasa, Nyasaland.

16 (M. C. Z. 26328-43) Iloilo, Rungwe district. iii-iv. 30.

1 (M. C. Z. 26375) Tukuyu, Rungwe district. 21. iv. 39.

1 (M. C. Z. 26574) Igale, Poroto Mtns. 30. iv. 30.

1 (M. C. Z. 26573) Ujiji, Lake Tanganyika. 30. v. 30.

Native name. *Ifuku* (Kinyakusa and Kinyika).

Discussion. The fine series of seventeen skins and skulls of *blesmols* from the vicinity of Rungwe Mountain are fairly uniform in their general cinnamon-gray coloring, which is only slightly duller below, although in some the rusty tint does not extend to the under side. They apparently represent Thomas's *Georychus whytei* described from Karonga which is about sixty miles southwest of Tukuyu and Iloilo. A single specimen from Ujiji on the east shore of Lake Tanganyika also seems to be the same. This mole-rat is very similar externally to *C. hottentotus* of South Africa, but differs in its considerably broader interorbital region and in the tendency of the premaxillae to surpass the posterior end of the nasals. As elsewhere stated by Thomas, the

skull of the type was of unusual size, and in zygomatic breadth is not equalled by any of the Rungwe series. A specimen from Mt. Chirinda in southeastern Rhodesia, presented by Dr. J. H. Sandground and taken to represent *C. darlingi*, is intermediate in the characters of the frontal region between typical *hottentotus* and *whytei*, and since it seems likely that the various named forms are chiefly at least mere geographical representatives of a single widespread species, we have ventured to regard *whytei* as a subspecies. Of the series listed, four show a slight trace of albinism in the presence of a narrow white edge bordering the dorsal rim of the nose pad. One from Ilolo (26,335) is melanistic, in that the cinnamon tips are practically lacking, and the entire pelage is dark slaty, with only an indication of the buffy wash. A second specimen (26,340) is nearly similar, with, however, a slightly more marked cinnamon tint. As an interesting correlation, these are the only ones of the series which have a small white blaze on the forehead, while the first has in addition a white median spot on the belly.

Measurements. The largest ♂ measured 160. 20. 20. 0 mm.; and ♀ 160. 20. 25. 0 mm.; both are from Ilolo. As they lack external ears no measurements can be given.

Enemies. One was recovered from the stomach of a House Snake (*Boaedon lineatus*) at Ilolo.

Habitat. The mounds thrown up by these blesmols were very numerous in the gardens of the natives both at Tukuyu and Ujiji, but having secured an adequate series (there is a series in alcohol in addition to those listed above) no attempt was made to get more.

CRYPTOMYS HOTTENTOTUS OCCLUSUS subsp. nov.

16 (M. C. Z. 26557-72) Kigogo, Uzungwe Mtns. i. 30.

Native name. *Fuko* (Kihehe).

Type. No. 26,557 Museum of Comparative Zoölogy. Adult ♂ skin and skull from Kigogo, Uzungwe Mountains, southwestern Tanganyika Territory. Collected by A. Loveridge, January 18, 1930.

Description. A large race, resembling *whytei* but slightly larger and of a much more slaty color; the nasals are abruptly tapered posteriorly and the tips of the premaxillae hook sharply inward nearly meeting behind them.

Entire pelage slaty gray with a faint cinnamon wash above, the whole shining or silvery like that of a mole; hands and feet sparsely covered with shining whitish hairs; nose pad narrowly ringed with white.

In general the skull resembles that of its nearest relative *whytei* in the breadth across the frontal region, but the nasals and posterior part of the premaxillae are quite different, for instead of tapering gradually to a point from near their middle, the nasals increase in breadth throughout almost their entire length and then are bevelled sharply off to their median point of contact, while the ascending portions of the premaxillae, instead of continuing nearly straight backwards to end just beyond the level of the nasals, hook sharply inward, practically meeting on the mid-line behind the nasals. The auditory bullae are slightly larger than in *whytei* and in adult male skulls the median and orbital ridges are more pronounced.

Measurements. The field measurements of the type are as follows: head and body 165 mm.; tail 10 mm.; hind foot 25 mm. The largest ♂ measures 170. 10. 25. 0 mm.; and ♀ 155. 10. 25. 0 mm.

The skull of the type measures: greatest length 41 mm.; basal length 34 mm.; palatal length 24.5 mm.; diastema 13 mm.; zygomatic width 25.8 mm.; mastoid width 18.2 mm.; width across frontals 12.8 mm.; interorbital constriction 8.2 mm.; nasals 15 mm.; upper cheek teeth 6 mm.; lower cheek teeth 6 mm.; greatest diagonal width of bulla 10 mm.

Discussion. In the Uzungwe region, this colony of mole-rats discovered by Loveridge appears to have developed a number of local peculiarities in color, size, and the relations of the bones of the rostrum, that are sufficiently marked to differentiate it at once from its nearest relatives to the south and west. This apparently is the most northeastern member of the genus yet discovered, although to the westward and northwestward it attains a wider distribution. Possibly its ecological niche is to some extent occupied to the northeastward by *Heliophobius* of similar habits. In all, if one includes those preserved in alcohol, more than a score of these blismols, very uniform in color and in cranial peculiarities, were collected at Kigogo in the Uzungwe Mountains.

HYSTRICIDAE

HYSTRIX GALEATA CONRADSI F. Müller

Hystrix galeata conradsi F. Müller, 1910, Sitzber. Ges. naturf. Freunde Berlin, p. 314: "Mwanza and Neuwied" (Ukerewe Island), Tanganyika Territory.

♂ ♀ (M. C. Z. 27126-7) Ukerewe Id., Lake Victoria. 16-19. vi. 30.

Native name. *Nogoti* (Kikerewe).

Discussion. The two skins and skulls listed above are topotypes

of this form which is further represented in the Museum by three others collected at Sagayo near Mwanza. All agree in the extraordinary inflation of the nasal chamber as well as in the great breadth of the nasals which extend back about to the level of the middle of the orbito-temporal fossa. The inflation of the anterior part of the nasal cavity is obviously much greater than in a skull from southeastern Rhodesia representing *H. africana-australis* and there is no doubt of the distinction between the two forms but until a more thorough and monographic study of the African porcupines can be made, the question of their subspecific relationships must be considered as still unsettled. I have, therefore, followed Müller in making this a subspecies of *galeata* rather than of *cristata* or *africana-australis*. The matter is further complicated by Müller's naming of a specimen from Tabora, Tanganyika Territory, which is about two hundred miles south of Ukerewe, *H. africana-australis prittwitzi*. This name appears only in connection with the figure of a skull on a previous page, the new name having evidently been omitted in its proper place by a printer's error, where only *Hystrix africana-australis* appears. If the two prove to be the same, *prittwitzi* has page precedence, but the figure seems to show it as having more tapering nasals.

Père Conrads, the collector of the types, informed the junior author that all the porcupines sent by him to the Berlin Museum were collected on Ukerewe Island and *not* at Mwanza on the neighboring lake shore.

Measurements. ♂ im. 530. 80. 70. 30 mm.; and ♀ 695. 100. 100. 42 mm.

Parasites. Ticks (*Rhipicephalus simus* var. *planus* Neumann) were taken from the female on which no fleas were found; fleas were very abundant on the male.

THRYONOMYIDAE

THRYONOMYS SWINDERIANUS VARIEGATUS (Peters)

Aulacodus variegatus Peters, 1852, Reise nach Mossamb., 1, p. 138: Tete, Mozambique.

♂ (M. C. Z. 26860) Ukerewe Id., Lake Victoria. 19. vi. 30.

Measurements. ♂ 430. 170. 75. 30 mm.

Discussion. The cane rat from Ukerewe Island is referred to this race on the basis of Thomas's review of the group. It covers a wide range from Uganda to the south and east.

LEPORIDAE

LEPUS CAPENSIS VICTORIAE Thomas

Lepus victoriae Thomas, 1893, Ann. Mag. Nat. Hist. (6), 12, p. 268: Nassa, Speke Gulf, Lake Victoria, Tanganyika Territory.

♂ (M. C. Z. 27151) Madehani, Ukinga Mtns. 21. ii. 30.

1 (M. C. Z. 26545) Ukerewe Id., Lake Victoria. 16. vi. 30.

Distribution. Hares, though not necessarily of this species, were also seen at Mpwapwa, Kilimatinde, Saranda, Unyanganyi, Mangasini, Dabaga, Kigogo and on the Senjeri Pass between Tukuyu and Abercorn.

Native names. *Sungula* (Kihehe); *sude* (Kikinga); *kalulu* (Kinyakusa); *kami* (Kikerewe).

Discussion. The Madehani specimen is a very large male, with the ochraceous areas of nape and fore limbs slightly deeper in tone than in the younger example from Ukerewe Island which is almost a topotype.

The skull of the former measures: occipito-nasal length 93 mm.; basal length 74 mm.; palatal length 40 mm.; zygomatic width 45 mm.; mastoid width 35 mm.; upper cheek teeth (alveoli) 15.5 mm.; lower cheek teeth (alveoli) 18 mm.

Measurements. The ♂ from Madehani measured 480. 100. 110. 100 mm. No measurements were taken of the second specimen which had been skinned by the native who brought it in; unfortunately he had not saved the pads though he had left the skull in place in the skin which had only just been removed.

Enemies. While hares were nowhere abundant, less than a dozen being seen during the eight-months' trip, it is probable that more might have been collected if they were not an article of diet. Evidently the Ukerewe specimen was skinned because the captor was fearful that he might not get the body back, though I always endeavoured to make it widely known that the bodies of any animals would be returned to the vendors without deduction in the reward offered for that particular species. The Madehani hare was brought to me by two native youngsters who had surprised and killed it in its form.

Folklore. Under *Aethosciurus lucifer* one story of a hare has already been related; another, which was told me by the same old Mnyakusa was as follows. Once upon a time a man was out hunting with his three dogs when they disturbed a hare and started in pursuit. The fleeing hare eventually sought refuge in a grass hut where it perceived a cock among the rafters. "Come down here to me," said the hare.

"Why should I come down?" answered the fowl. "You are only an animal, is there any reason why I should obey you?" To this the hare made reply, "Word has just come from the Europeans that we are all to live peaceably together." "All right," said the cock "then perhaps you will come up here and sit with me." The hare attempted to climb one of the posts but failed. Just at that moment the fowl, from its elevated position, saw the three dogs approaching and exclaimed, "I see some dogs coming." "Good-bye," shouted the hare, and bolted. The cock called after him, "Why should you fear the dogs if it is, as you say, the Europeans' regulation that we should all live peaceably together."

The humour of this story is more apparent to those who are familiar with the early history of this corner of the Territory where so much intertribal fighting was in vogue until the advent of Europeans enforced law and order.

SUIDAE

KOIROPOTAMUS KOIROPOTAMUS DAEMONIS (Major)

Potamochoerus chaeropotamus daemonis Major, 1897, Proc. Zoöl. Soc. London, p. 367: Mt. Kilimanjaro, Tanganyika Territory.

2 skulls (M. C. Z. 27314-5) Kigogo, Uzungwe Mtns. i. 30.

Native name. *Ngubi* (Kilhehe).

Discussion. Two skulls were obtained from the natives at Kigogo, one of a young animal with worn milk teeth, and the first molar in place, the other with the permanent dentition all in place except the last molar. In the younger one there is yet no sign of the bony projection behind the canine forming the wall of the groove for the tendons of the snout.

BOVIDAE

CEPHALOPHUS MELANORHEUS LUGENS Thomas

Cephalophus lugens Thomas, 1898, Proc. Zoöl. Soc. London, p. 393: Urori, Usangu, Tanganyika Territory.

4 (M. C. Z. 26549, 27239-41) Nkuka Forest, Rungwe Mtn. 28. iii. & 12. iv. 30.

Native names. *Asesi* (Kikinga); *akasasi* (Kinyakusa).

Discussion. These specimens were taken not far southwest of the type locality, and agree closely with the original description. We regard this form as only a subspecies of *C. melanorheus*, from which

it differs in darker coloring without the contrasting white hip stripe. In color it is curiously similar to the small Chinese deer of the genus *Elaphodus*, which it resembles in the uniform blackish brown above with sharply contrasted white beneath the tail and white on the inner side of the ear, but in the antelope, the outer base instead of the tip of the ear is white.

Measurements. The larger ♂ measured 600. 90. 155. 60 mm., larger ♀ 650. 100. 160. 60 mm.

Breeding. A female shot on April 12 appeared to be nursing.

Diet. The stomach of a young male measuring 500. 70. 145. 55 mm. held vegetable matter but no milk.

Parasites. Nematodes were taken from the stomach of one male.

Enemies. Fur of this duiker was found in the fresh droppings of a leopard not far from where the animals were shot.

Habits. When scenting a human being these forest duiker emit an explosive, sneeze-like sound as they make off through the undergrowth; they are very rarely seen except by those who set out specially to seek them. I shot one female at 5 p.m. as it glided into view and paused behind a stump before crossing a trail through the forest. Though I had been sitting watching the spot I heard no sound of its coming. It dropped stone dead with a charge of No. 3 shot from a 12-bore choke barrel. An adult and juvenile male were killed with one charge of slug shot, the younger animal being concealed when the former was fired at.

SYLVICAPRA GRIMMIA subsp.

♀ (M. C. Z. 27238) Kigogo, Uzungwe Mtns. 24. i. 30.

Native name. ? *Haluzi* (Kihehe).

Discussion. In view of the various subspecific names applied to East African bush duikers of this species and the lack of sufficient comparable material, it seems advisable to omit the trinomial. Probably it is close to *nyansae* which was described from the Kavirondo district, Lake Victoria.

Measurements. ♀ 990. 150. 295. 114 mm.

Breeding. Shot on January 24 when it was undoubtedly nursing.

Diet. The leaves of an euphorbiaceous shrub were found in its stomach.

Parasites. There were ticks in its coat and tapeworms (*Trichocephalus* sp.) in its stomach.

Habits. Shot at 6 p.m. when it was stealing along near the edge of a patch of forest, probably having come out to feed.

RAPHICERUS CAMPESTRIS NEUMANNI (Matschie)

Pediotragus neumanni Matschie, 1894, Sitzber. Ges. naturf. Freunde Berlin, p. 122: Ugogo, Tanganyika Territory.

♀ (M. C. Z. 27255) Near Njombe, Ubena Mtns. 6. ii. 30.

Discussion. The above specimen should be nearly typical. It has the dark coronal spot well defined though small but the eyelids are buffy whitish instead of clear white, the body bright chestnut, the neck much paler, nearly ochraceous.

Measurements. ♀ 830. 55. 220. 107 mm.

Habits. On January 31, when near Herr Fink's farm about ten miles west of Mufindi Post Office, no fewer than six of these beautiful little steinbuck were seen between 8 and 9 a.m. as we drove along the road in a motor lorry. The grass had been burnt off and fresh short grass had sprung up in the open ground between the scattered, but numerous, thickets. One pair was standing together, the other four individuals were seen at intervals; all exhibited great boldness, remaining motionless within a hundred yards of the lorry.

On February 6, when forty-five miles west of Mufindi Post Office, on the Njombe Road, a solitary female was observed resting in the grass, she rose and ran a short distance, then halted by a thicket where I dropped her dead.

RHYNCHOTRAGUS KIRKI NYIKAE Heller

Rhynchotragus kirki nyikae Heller, 1913, Smithsonian Misc. Coll., 61, no: 3, p. 3: Ndi, near Voi, Kenya Colony.

♂ (M. C. Z. 25735) Saranda, Ugogo. 20. xi. 29.

♂ (M. C. Z. 25734) Unyanganyi, Turu. 5. xii. 29.

♂ (M. C. Z. 25720) Mangasini, Usandawi. 14. xii. 29.

Native name. *Nguyhuya* (Kinyaturu and Kisandawi).

Discussion. This is a pale race which inhabits the dry thorn bush country, its range extending southwards into central Tanganyika.

Measurements. The largest ♂ measured 680. 30. 170. 75 mm., the juvenile from Mangasini, only 300. 25. 115. 55 mm.

Breeding. The Mangasini dikdik could have been born only a short time previously. It was brought in by a native who said that his dog had caught it. At dusk the mother came close to camp uttering a wheezing call. I prepared to take the animal out but by the time I had caught it she had bolted and to leave it in the open was to offer it to the prowling hyenas. It was observed that the young one made

no reply to the calls but during the night it emitted a whistling sound and wandered about the tent with luminous matter on its nose as well as on the fore and hind feet of the left side; presumably it had been nosing one of the phosphorescent geophilids. Though only fit for a milk diet it refused all attempts to feed it and so was chloroformed the following morning.

Parasites. Nematodes (*Setaria* sp.) were recovered from the stomach of the Unyanganyi male.

REDUNCA ARUNDINUM (Boddaert)

Antilope arundinum Boddaert, 1785, *Elenchus Anim.*, p. 157: Unknown.

3 (M. C. Z. 26468, 27228-9) Ipemi, Uzungwe Mtns. 7. i. 30.

Fetus and 4 (M. C. Z. 27311, 27231-2, 35) Mwaya, Lake Nyasa. 1-7. iii. 30.

Native names. *Ngholigata* (Kihehe); *suwela* (Kinyakusa; corruption of *swara*?).

Discussion. These specimens of the South African Reedbuck are interesting as bringing its range into the Uzungwe Mountains of south-central Tanganyika Territory. It has been reported also as far north as the Bahr el Ghazal region, but this may require confirmation.

The coloration seems to be typical of the usual fulvous or fawn condition, rather than of the more grayish type, described by Sclater as *thomasiinae*, from Nyasaland, but regarded by Lydekker as a variant of the same species.

Measurements. The largest ♂ (Ipemi) measured 1,500. 270. 480. 175 mm.; largest ♀ (Mwaya) 1,410. 260. 405. 168 mm.

Breeding. The female from Ipemi contained no fetus, neither did one shot at Mwaya on March 1, which was running with a male. On March 5, however, a female was killed carrying a fetus measuring ♀ 280. 67. 91. 36 mm., and a big young one, quite able to take care of itself, was seen on the same day. On March 7, I chloroformed a young one (♀ 510. 100. 220. 70 mm.), which was brought to me, as it would not have survived the long motor-lorry journey which lay ahead of us.

Habits. South African Reedbuck were very plentiful at Ipemi at the time of our visit; half a dozen pairs were seen lying or standing on the hillsides at various hours of the day. If suddenly surprised close at hand, the male utters a loud wheezing cry as he makes off. When thoroughly alarmed refuge is sought in one of the numerous

deep ravines, more or less choked by rank grass and vegetation, with which the mountain sides are scarred. These reedbuck would not permit one to approach within two hundred yards but at anything over that distance they would stand to be shot at, trot a little way and stand again so that it was much like shooting cattle in a pasture.

At Mwaya, on the other hand, they were found in the water-logged plain which stretches from the Mbaka River to the mountains of Nyasaland. The grass was waist- and in places shoulder-high so that the animals lay low till one was almost upon them before making off and in general they appeared wild and shy. On the evening of March 7, I saw a mother and a big young one feeding near camp. They behaved very foolishly for they ran round a clump of sedges then crept into it in full view; I left them unmolested.

KOBUS ELLIPSIPRYMNUS KONDENSIS Matschie

Kobus ellipsiprymnus kondensis Matschie, 1911, Mitt. Zoöl. Mus. Berlin, 5, p. 556: Mwaya and Mbaka, Tanganyika Territory.

Kobus ellipsiprymnus lipuwa Matschie, 1911, Mitt. Zoöl. Mus. Berlin, 5, p. 560: Mwaya, Tanganyika Territory.

4 (M. C. Z. 27102-4, 27312) Mwaya to Mbaka, Lake Nyasa. 3-4. iii. 30.

Discussion. Shot between Mwaya and the Mbaka River six miles west or northwest of Mwaya, these specimens are topotypes of both Matschie's forms. Without a sufficient series for comparison it is, of course, impossible to give a definite opinion as to the validity of *kondensis*. The characters claimed for it are: the incompleteness of the white hoof band and the dark color of the rest of the foot, while the generally less-dark coloring is supposed to distinguish it from its neighbor to the north, to which Matschie gives the name *thikae*. Lydekker lists these and various other races without being able to pass upon their status.

Measurements. The largest ♂ measured 2,150. 330. 490. 200 mm., only ♀ 2,090. 340. 480. 190 mm.

Breeding. The female shot on March 3 was running with three other does and upon dissection was found to be carrying a fetus (♀ 780. 200. 300. 120 mm.), which at most was within three days of birth. Its skin and skull were preserved.

Parasites. Nematodes (*Setaria hornbyi*) and bots were collected from the stomach of the female.

Habits. In the early morning these fine waterbuck might be found

feeding in the glades of the rather dry woodlands, but during the intense heat of noonday they retire to the vast swamps where they must lie in the water which was about a foot deep at the spot where I disturbed them. Though there was maiombo forest and dense thickets in close proximity to the swamp they evidently prefer the latter, where they were completely hidden by the sword grass which was from nine to twelve feet in height. Nor could they be approached quietly in this situation for any attempt to push through the grass resulted in noise which gave them ample warning and they would be heard splashing away but never seen.

ADENOTA VARDONI SENGANUS (Sclater & Thomas)

Cobus senganus Sclater & Thomas, 1896, Book of Antelopes, 2, p. 145: Senga, northern Rhodesia.

3 (M. C. Z. 27230, 27233, 27236) near Mwaya, Lake Nyasa. 1-5. iii. 30.

Native name. *Kangosa* (Kinyakusa).

Discussion. This race differs from typical *vardoni*, according to Lydekker's key (1914, Cat. Ungulates, 2, p. 268), in slightly smaller size, larger black ear-tips occupying fully one third the length of the backs of the ears, and in the generally darker color. The localities indicated in his list of specimens, however, make one skeptical of the value of these characters. Nevertheless as the three specimens from Mwaya agree in the extensive black tips to the ears, and as Mwaya, on the northwest end of Lake Nyasa is not far east of the type locality, Senga in the Upper Loangwa Valley, I refer them to that form.

Measurements. The juvenile ♂ measured 1,510. 310. 430. 160. mm., the larger ♀ 1,640. 220. 420. 150 mm.

Parasites. No parasites were found on the first lechwe, but bots were present in the stomach of a second and a tabanid was taken on the skin.

TRAGELAPHUS SCRIPTUS MASSAICUS Neumann

Tragelaphus massaicus Neumann, 1902, Sitzber. Ges. naturf. Freunde Berlin, p. 96: upper Bubu Valley, northwest of Irangi, Tanganyika Territory.

Young ♀ (M. C. Z. 27234) Dabaga, Uzungwe Mtns. 2. i. 30.

Distribution. Many were seen at Kigogo, a fine male in a swamp at Mwaya and tracks observed at Ilolo.

Native names. *Matu* (Kihehe); *imbarwara* (Kinyakusa).

Discussion. This specimen is very young but shows the essential pattern of the adult, with four transverse white stripes and a series of white spots on the haunches. There is, however, no nose spot, and the dark stripe on the fore legs is very faint. The neck is well haired, without bare area, but with a distinct, though small, whorl at the base dorsally where the hair is directed outward and slightly forward. This race ranges from Mombasa to Nyasaland.

Measurements. ♀ juv. 620. 100. 200. 100 mm.

Folklore. The following story was related by an old Mnyakusa and seems so peculiar as to have had, perhaps, a basis in fact. Once upon a time a woman said to her child, "Now that your father is dead I wish that you would go and hunt a bushbuck and when you have killed it, give me the skin to wear." The lad did as he was asked, was successful in the hunt and gave his mother the skin to wear. Sometime afterwards they were working together in the fields when his mother said she was tired and would rest awhile at the edge of the garden where it abutted on the forest. As she was sleeping, some hunters came along and catching sight of the bushbuck's skin through the bushes, cast a spear which killed the old woman. "What do you mean by killing my mother in her own garden?" cried the son to the hunters, "you owe me much for this." As a result of their mistake the youth profited greatly for he was given cows, a goat and other things by way of compensation.

ELEPHANTIDAE

LOXODONTA AFRICANA KNOCHENHAUERI (Matschie)

Elephas africanus knochenhaueri Matschie, 1900, Sitzber. Ges. naturf. Freunde Berlin, p. 197: Tanganyika Territory.

Foot skin (M. C. Z. 27318) Ukerewe Id., Lake Victoria. vi. 30.

Discussion. The skin of an elephant's foot from Ukerewe Island was presented to the museum by Père Conrads, being from one of the animals killed (shortly before Mr. Loveridge's visit) by order of Sir Donald Cameron, who had the whole herd exterminated. This specimen is of interest on account of the reputed racial difference of the island animals from those of the adjacent mainland. No doubt, however, at times of unusually low water, elephants could have crossed the separating channel, and it is hardly to be doubted that this is the

same as the animal of Tanganyika Territory for which the proper name is perhaps that given above. The systematic value of the variations in ear outline of African elephants is, however, very questionable, but Matschie has adduced skull characters as well, which he believed distinctive of this race. Notwithstanding the generally naked appearance of elephant hide, it is in fact beset with short scattered hairs, even the foot is well studded with them.

PROCAVIIDAE

PROCAVIA MATSCHIEI Neumann

Procapia matschiei Neumann, 1900, Zoöl. Jahrb. Syst., **13**, p. 555: Mwanza, Tanganyika Territory.

♂ (M. C. Z. 26556) Mwanza, Usukuma. 4. vi. 30.

Discussion. In the series of hyraxes from Mwanza, is a single topotype of *P. matschiei*, briefly characterized by Neumann. The species is very different in color from those of the *brucei* group, of a general pale yellowish brown, or olive brown, with a yellowish-white dorsal spot, the forehead a darker brown, the face grizzled gray and brown like the feet. This hyrax is of large size and a member of the big-toothed group. The skull (in stage viii) measures: greatest length 94 mm.; basal length 91 mm.; palatal length 50 mm.; zygomatic width 55 mm.; mastoid width 37 mm.; across molars 33 mm.; upper cheek teeth 40 mm.; lower cheek teeth 41 mm. In the skull, the temporal ridges have met at the occiput.

Measurements. This ♂ measured 550. 0. 70. 30 mm.

Parasites. Nematodes (*Crossophorus collaris*) were present in its stomach.

HETEROHYRAX BRUCEI VICTORIA-NJANSÆ Brauer

Heterohyrax brucei victoria-njansæ Brauer, 1917, Sitzber. Ges. naturf. Freunde Berlin, p. 299: Nyangesi, Mwanza, Tanganyika Territory.

7 (M. C. Z. 26482, 26529, 26902, 26904-7) Mwanza, Usukuma. 6. vi. 30.

Discussion. This series of four males and three females of the *brucei* group should represent Brauer's *victoria-njansæ*, the types of which were from Nyangesi, Mwanza and Mondo. They are distinguished from *prittwitzi* by the more obvious yellowish wash of the throat and belly, a tint that extends to the paler areas of the muzzle and ocular regions as well. From the neighbouring race

diesneri of Speke Gulf, they differ further in having gray bases to the belly hairs as well. The differences claimed for these three races, though not very well marked, seem nevertheless appreciable in the series at hand. One young one is very much darker than the adults.

Measurements. The largest ♂ measured 480. 0. 70. 30 mm.; the largest ♀ 440. 0. 70. 30 mm.

Breeding. Only one of the females held fetuses, and these (two) were well developed. The ♂ measured 160. 0. 28. 15 mm.; the ♀ 160. 0. 27. 16 mm. A native brought in a young ♂ hyrax which measured 230. 0. 40. 22 mm.

Parasites. Worms (*Crossophorus collaris*) were present in their stomachs.

Habits. This series was shot on the rocks an hour's walk north of the town yet close to the lake shore. When walking back to camp in the moonlight I was astonished to hear these hyraxes calling with a musical and attractive bird-like note; they are very noisy creatures and are able to utter a great variety of sounds.

HETEROHYRAX BRUCEI DIESNERI Brauer

Heterohyrax brucei diesneri Brauer, 1917, Sitzber. Ges. naturf. Freunde, Berlin, p. 298: Speke Gulf, and vicinity, Lake Victoria, Tanganyika Territory.

♂ (M. C. Z. 26903) Ukerewe Id., Lake Victoria. 12. vi. 30.

Discussion. Brauer in his description of this race mentioned no type specimen nor type locality. He had specimens, however, from Ukerewe Island, two localities on Speke Gulf and others from the Serengeti Plains. He states that it differs from the race *victorianjansae* in the white instead of whitish-gray belly and in the much shorter interparietal. The single specimen obtained by Loveridge on Ukerewe Island does, indeed, differ from the Mwanza series of the latter in having the belly hairs white to the roots instead of being whitish with gray bases. In other respects the two forms are essentially alike in color, but if the character mentioned is constant, the race *diesneri* may be considered valid. The specimen, a male, is in stage viii, and is of maximum size. Its skull measures: greatest length 85 mm.; basal length 81 mm.; palatal length 44 mm.; zygomatic width 50 mm.; width across molars 17.5 mm.; mastoid width 35 mm.; upper cheek teeth 34.5 mm.; lower cheek teeth 34 mm.

Measurements. ♂ 480. 0. 65. 35 mm.

Habits. These animals are somewhat scarce on the island, though the people say that they do not eat them. When contrasted with

the numerical abundance of the allied race found near Mwanza township the relative scarcity of hyrax upon the island is surprising.

HETEROHYRAX BRUCEI PRITTWITZI Brauer

Heterohyrax brucei prittwitzi Brauer, 1917, Sitzber. Ges. naturf. Freunde Berlin, p. 299: Kilimatinde; Mpwapwa and Uhehe, Tanganyika Territory.

5 (M. C. Z. 25834-5, 25837-9, 26852) Kilimatinde, Ugogo. 27. xi. 29.

3 (M. C. Z. 26856-8) Unyanganyi, Turu. 5. xii. 29.

2 (M. C. Z. 26548-9) Dodoma, Ugogo. 23. xii. 29.

Native name. *Pimbi* (Kinyaturu).

Discussion. Brauer separates as a subspecies, *prittwitzi*, the form of *Heterohyrax brucei* at Kilimatinde, Mpwapwa and Uhehe on the ground of very short dorsal portion of the supraoccipital (less than 3.5 mm. long) and faint yellowish tint of the whitish under surfaces. The series of topotypes (to select Kilimatinde as the type locality) secured by Loveridge includes immatures and adults, which seem to differ also from neighboring races in the very pale shoulders and large extent of the pale area behind the ears, the great length of the ochraceous median line and the ochraceous, rather than whitish, supraorbital patch, which is so extensive as nearly to form a ring about the eye.

Two others from Dodoma to the east and three from Unyanganyi slightly farther north, come from within the range of this form as defined by Brauer.

The character mentioned by Brauer, of the very short dorsal portion of the supraoccipital, seems to hold on the average, although in one adult the length is 4 mm.

Measurements. The largest ♂ (Kilimatinde) measured 420. 0. 65. 33 mm.; largest ♀ (Unyanganyi) 490. 0. 70. 36 mm.

Parasites. In all three localities these hyraxes were infested with nematodes (*Crossophorus collaris*); in addition the Dodoma specimens held *Hoplodontophorus flagellum*, *Theiliana brachylaima*, and *Setaria* sp.

Habits. At Kilimatinde these animals were exceedingly shy and I only obtained the series by waiting quietly until they should emerge from their retreats among the rocks in the dry bed of the river, and at dusk by intercepting three which were out feeding some little distance from their rocks; these were all shot on the run. Salimu actually secured the pair from Dodoma by shooting with dust shot from a .410 collecting gun.

HETEROHYRAX LADEMANNI Brauer

Heterohyrax lademanni Brauer, 1917, Sitzber. Ges. naturf. Freunde Berlin, p. 298: Mwakete, Livingstone Mtns., etc., Tanganyika Territory.

♂ ♂ ♀ (M. C. Z. 26457, 26901, 26916) Rungwe Mountains. 4-5. iv. 30.

Discussion. This, as Brauer says in describing it, is colored much like *Dendrohyrax validus*, of which, through the kindness of Mr. G. S. Miller, Jr. and Dr. R. Kellogg, I have been able to examine topotypes from Mt. Kilimanjaro. It is, however, although equally dark-colored above, and dull ochraceous below, a much grayer animal, lacking the rich ochraceous tones of *D. validus*, while its skull is that of a *Heterohyrax*, without sign of the interparietal even in immature animals of stage vi or vii, and with the postorbital process separate from the jugal. Compared with skulls of *H. brucei*, an obvious characteristic is that the temporal ridges are nearly parallelsided on the parietal walls and look as if they would not meet even in old age.

This species, like *Aethosciurus lucifer*, seems to be one of restricted range in the Livingstone Mountains and the adjacent region. Brauer's original specimens came from Mwakete in the Livingstone Range and Milow, Msangwa and Mlando in Upangwa just to the east. Brauer states that they live in trees, which is probably correct, but Loveridge found them among moss-grown rocks outside the forest.

Measurements. The larger ♂ measured 480. 0. 75. 35 mm.; and the ♀ 380. 0. 65. 30 mm.

Parasites. Nematodes (*Inermicapsifer* sp.) were found together with cestodes in their stomachs.

Habitat. These hyrax were obtained after an hour's quick walking from my camp in the Nkuka Forest, along the edge of the forest in a northerly direction. The spot where they are most abundant is on the slopes of Rungwe where a square mile is strewn with volcanic boulders, presenting a sharp rough surface and often a jagged edge. Progress across this area was very difficult for many of the rocks were loosely balanced and tipped up when stepped upon, shrubs and even stunted trees grew in profusion. In fact some areas were so densely overgrown with vegetation as to be impenetrable and one was reminded of similar spots in Massachusetts usually given over to cat-thorn; though here, fortunately, there was no thorn, and brambles were comparatively rare. A further reminder of home was the presence of numerous webs of caterpillars in the trees! All the rocks provided a base for lichens of many different species and most of them were

overgrown with moss as well. This moss often concealed crevices, which were many feet in depth, between the boulders, and sometimes when one stepped upon an apparently flat surface the moss would slip and slide away down a concealed slope. Such accidents caused one to sit down suddenly and if upon a patch of moss the result was the same as sitting upon a wet sponge.

Progress was often similar to a scramble over seaweed-covered rocks at low tide, though here one was hampered by carrying a gun. At last a hyrax was observed quietly watching us from a distance of a hundred feet away; apparently they are not nearly so shy as those on the kopjes at Dodoma and elsewhere but, as I only secured this individual, others may have been present and slipped away unseen.

A striking difference was to be observed between the dens of *lademanni* and those of the *brucei* races in the Central Province. While those of *brucei* are foul smelling and surrounded by the excrement accumulated over a period of years, these dens on Rungwe — owing doubtless to the constant downpour of rain — are clean and almost entirely free of excrement, which must get washed down into the depths of the larva formation. Presumably as a corollary to these conditions the pelts of these Rungwe hyrax were clean and free from disease and no fleas or other ectoparasites were observed.

EXPLANATION OF PLATE

PLATE 1

PLATE 1

FIG. 1. ELEPHANT ENTRAPPED IN A MORASS AT KIPARA, USANDAWI

When the junior author was camped at Mangasini, Usandawi, he was presented with a remarkable photograph taken by Mr. H. J. Fliegner, at that time resident of Kwa Mtoro Farm. The picture shows an elephant entrapped in a morass at Kipara, Usandawi, on February 27, 1929. Kipara is more or less north of Saranda on the Central Railway. Mr. Fliegner informed Mr. Loveridge that in this region there are mud springs in otherwise hard ground; the welling up of the mud has been going on for years. The grass in the vicinity of the mud is salt grass and attracts game, while the mud forms a veritable trap for unwary animals. The natives say that many rhinoceros and elephant perish by being engulfed. After taking the photograph Mr. Fleigner shot the elephant for humanitarian reasons. It was quite impossible to recover the ivory, and shortly after being killed the whole animal disappeared in the morass. This incident was communicated to the weekly "East Africa" for April 10, 1930, in whose columns a discussion was in progress on the subject of what became of old elephants. We are indebted to the Editor for the use of the block reproduced above.

FIG. 2. TYPICAL GALLERY PRIMARY FOREST IN TANGANYIKA

Such gallery forest occurs along the banks of the larger rivers. It occasionally harbors rain-forest forms and provides a possible means of dispersal.



1



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M C.Z.-7
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REPORTS ON THE SCIENTIFIC RESULTS OF AN
EXPEDITION TO THE SOUTHWESTERN HIGHLANDS
OF TANGANYIKA TERRITORY

III

BIRDS

BY OUTRAM BANGS AND ARTHUR LOVERIDGE

WITH ONE PLATE

CAMBRIDGE, MASS., U. S. A.

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Parasites are treated under a separate heading following the species in, or on, which they were found. In this connection we should like to express our indebtedness to our colleagues, Dr. J. H. Sandground and Dr. J. Bequaert, for making the identifications of the endo- and ectoparasites respectively.

We should also like to thank Dr. H. Friedmann for comparing certain skins with the types in the United States National Museum and for making provisional identifications of half a dozen immature, or female, weaver birds, and to Dr. E. Stresemann for comparing the series of *Bradypterus* with the types in the Berlin Museum, also Mr. W. L. Sclater for examining certain white-eyes and confirming our opinion as to their identity. Like all other workers in the field of African ornithology, our labors have been greatly lightened and assisted by Mr. Sclater's *Systema Avium Aethiopicarum*, 1924 and 1930, whose arrangement and nomenclature are closely followed in this paper excepting in a few cases where we recognize races that he has placed in the synonymy.

Systematic List of Species Collected

COLYMBIDAE

POLIOCEPHALUS RUFCOLLIS CAPENSIS (Salvadori)

Podiceps capensis Salvadori, 1884, Ann. Mus. Civ. Genova (2), 1, p. 252: Shoa, Ethiopia.

♂ (M. C. Z. 148,201) Mangasini, Usandawi. 16. xii. 29.

Habitat. Taken at a small waterhole in this typically dry thorn-bush country.

PHALACROCORACIDAE

PHALACROCORAX AFRICANUS AFRICANUS (Gmelin)

Pelecanus africanus Gmelin, 1789, Syst. Nat., 1, pt. 2, p. 577: Africa.

♀ (M. C. Z. 148,202) Mwaya, Lake Nyasa. 6. iii. 30.

♂ (M. C. Z. 148,203) Mwanza, Lake Victoria. 6. vi. 30.

Parasites. Nematodes (*Contracaecum spiculigerum*) were recovered from the stomach of the female Long-tailed Cormorant.

ANHINGIDAE

ANHINGA RUFA RUFA (Lacépède & Daudin)

Plotus rufus Lacépède et Daudin, 1802, in Buffon's Hist. Nat. (18 mo, Didot ed.) Quadr., 14, p. 319: Senegal (*ex* Daubenton, Pl. Enl. 107).

♀ (M. C. Z. 148,204) Ujiji, Lake Tanganyika. 24. v. 30.

Breeding. On May 24, when paddling up the Luiche River, we came upon a colony of African Darters. There must have been nearly fifty adult birds perched in one or other of two thorn trees which, partly submerged, were growing from the river, in flood at the time of our visit. Neither tree was of very great size, for they only projected about twenty feet above the surface of the water. Nine nests were to be seen and one of the boatmen, or myself, procured clutches in all the four lower ones; we were unable to reach the others. Beside each of two of the topmost nests were perched three young; those of one group were almost fledged. They dived promptly from their perches to disappear beneath the water and were not seen again. The other three young were still in white down, and one of these I shot and preserved. Whether the nests beside which they were perched contained eggs or not I am unable to say. I came to the conclusion that as soon as one hatching was able to leave the nest, the latter was probably utilized for a fresh laying.

The condition of the eggs was no less interesting, one clutch (marked "A") was perfectly fresh, clutches "B" and "C" were slightly incubated but easily blown, while in two of the eggs of the remaining clutch "D" there were young ones with well-formed feet, but still were blowable through 6 mm. diameter holes. Three of the clutches consisted of three eggs and one of four. The shells were thin and easily drilled; actually they are the same greenish-blue as the egg of a heron but are so overlaid with chalk as to have the blue almost entirely obscured and thus exhibit an appearance rather like miniature gannet eggs. Several of the eggs had blood smears upon their surface. The measurements of the eggs in these four clutches were as follows: (A) 52 x 38 mm.; (B) 52 x 34 mm.; (C) 56 x 36 mm.; (D) 53 x 37 mm.; and 50 x 38 mm. From the measurements of the eggs in this last clutch, which consisted of four, it would appear probable that the single egg which is 3 mm. shorter than the other three was laid by a different bird from the one which laid the three.

ARDEIDAE

ARDEA MELANOCEPHALA Vigors & Children

Ardea melanocephala Vigors & Children, 1826, in Denh. & Clapp. Trav., 2, App. xxi, p. 201: probably near Lake Chad.

♀ (M. C. Z. 148,205) Mwaya, Lake Nyasa. 4. iii. 30.

♂ (M. C. Z. 148,206) Ujiji, Lake Tanganyika. 23. v. 30.

Breeding. On March 10, 1930, while taking a stroll about sunset in the vicinity of Mwaya, I observed many Black-headed Herons wading their way to a large tree which was two miles west of Lake Nyasa; almost every bird carried long wisps of grass or sedge in its bill so that I concluded that the many nests which I could see were only in process of construction. However, when we struck camp the following morning, I detailed Salimu and another native to remain behind and examine the nests before proceeding to the next camp. Later in the day Salimu arrived and reported that many of the nests contained young and though he had found others in which there were eggs, he had held these eggs to the light and they appeared so near to hatching that he did not remove any.

On June 28, 1930, I noticed several Black-headed Herons, with grass in their beaks, flying to a group of trees behind some Indian shops almost in the centre of Entebbe, Uganda. Salimu climbed one of these trees and brought me a clutch of three eggs which were blowable, though they held well-formed young. The eggs were of the typical greenish-blue of heron's eggs and measured 60 x 38 mm.

Diet. The stomach of the male, which is in immature plumage, held rat's fur, a grasshopper and a large black cricket.

ARDEA PURPUREA PURPUREA Linnaeus

Ardea purpurea Linnaeus, 1766, Syst. Nat. 12th ed., 1, p. 236. "in Oriente."

♀ (M. C. Z. 148,207) Ujiji, Lake Tanganyika. 24. v. 30.

Breeding. I shot this Purple Heron among papyrus growing from the lake just south of Ujiji. The bird was in such beautiful plumage that it seems impossible to escape from the conviction that it was a breeding bird, probably nesting in the vast swamps of sedge and papyrus which border the lake for miles at this spot.

BUBULCULUS IBIS (Linnaeus)

Ardea ibis Linnaeus, 1758, Syst. Nat. 10th ed., p. 144: Egypt.

♂ ♀ (M. C. Z. 148,208-9) Bagamoyo. 11. xi. 29.

Diet. The stomachs of these Buff-backed Herons held a Mascarene Frog (*Rana m. mascareniensis*), a great many grasshoppers and a cockchafer.

ERYTHROCYNUS RUFIVENTRIS (Sundevall)

Ardea rufiventris Sundevall, 1851, Oefv. K. Vet.-Akad. Förh. Stockholm for 1850, p. 110: Caffraria superior, type in the Stockholm Museum collected on the Mooje (i.e. Mooi) River, near Potchefstroom, Transvaal.

♀ (M. C. Z. 148,210) Mwaya, Lake Nyasa. 6. iii. 30.

Habitat. Shot on a small pool on the flooded flats southwest of Mwaya, several other Rufous-bellied Herons were seen the same day but were very wary.

IXOBRYCHUS MINUTUS PAYESII (Hartlaub)

Ardea payesii Hartlaub, 1858, Journ. Ornith., p. 42 (ex Verreaux): Casamanse, Senegal.

♂ (M. C. Z. 148,211) Ujiji, Lake Tanganyika. 26. v. 30.

SCOPIDAE

SCOPUS UMBRETTA BANNERMANI C. Grant

Scopus umbretta bannermani C. Grant, 1914, Bull. Brit. Orn. Cl., **35**, p. 27: Mt. Leganisho, Kenya Colony.

Breeding. No attempt was made to secure specimens of the well-known Greater Hammerkop, but at Ukerewe Island in Lake Victoria a nest was found in the fork of a tree. It was placed at a height of only eight feet from the ground and on June 17, 1930 held three recently hatched young; these we left unmolested.

CICONIIDAE

SPHENORHYNCHUS ABDIMII (Lichtenstein)

Ciconia abdimii Lichtenstein, 1823, Verz. Doubl. Mus. Berlin, p. 76: near Dongola, Sudan.

♂ (M. C. Z. 148,212) Unyanganyi, Turu. 5. xii. 29.

This White-bellied Stork was shot from a flock of fifty or more

birds which appeared near our camp one morning; they were advancing slowly in a wide semicircle, devouring insects as they strode along.

LEPTOPTILOS CRUMENIFERUS (Lesson)

Ciconia crumenifera Lesson, 1831, *Traité d'Orn.*, p. 585: Senegal.

Marabou in astonishing numbers were seen on the lofty cliffs just below the Kalambo Falls, the falls themselves being eight hundred feet high. It seems probable that they were nesting at the time of my visit (May 12, 1930), but we were too far off to be able to distinguish nests.

PLEGADIDAE

HAGEDASHIA HAGEDASH NILOTICA Neumann

Hagedashia hagedash nilotica Neumann, 1909, *Ornis*, **13**, p. 193: Kimo, near Addis Ababa, Ethiopia.

♂ (M. C. Z. 148,213) Mwaya, Lake Nyasa. 4. iii. 30.

♂ ♀ (M. C. Z. 148,214-5) Mwanza, Lake Victoria. 6. vi. 30.

Variation. The bills of the two Mwanza birds are distinctly *shorter* than that of the Nyasa bird, though one would expect the opposite to be the case. Dr. Friedmann, who has also examined these specimens, considers them somewhat intermediate between *nilotica* and *erlangeri*.

Parasites. Lice were recovered from the plumage of the Mwaya Nile Valley Hadada and nematode worms (*Contracaccum* sp. and *Heterakis* sp.) from the stomach of one of the Mwanza birds.

ANATIDAE

SARKIDIORNIS MELANONOTUS (Pennant)

Anser melanonotus Pennant, 1838, *Ind. Zoöl.*, p. 12, pl. xi: Ceylon.

♂ (M. C. Z. 148,216) Kitingwe, near Bahi, Ugogo. 19. xii. 29.

2♂ 3♀ (M. C. Z. 148,217-21) Shinyanga, Usukuma. 4. vi. 30.

Variation. The five Shinyanga birds are immature, the males lacking all trace of the fleshy protuberance so characteristic of the adult Knob-billed Goose.

Parasites. Lice were recovered from the plumage of the Shinyanga birds.

AEGYPIIDAE

NECROSYRTES MONACHUS PILEATUS (Burchell)

Vultur pileatus Burchell, 1824, Travels, 2, p. 195: country south of Orange River, South Africa.

♂ (M. C. Z. 148,222) Kigogo, Uzungwe Mtns., 21. i. 30.

Vultures were daily seen in these mountains but always circling at a great height. The Southern Hooded Vulture obtained, ventured down to investigate the skinners when at work.

FALCONIDAE

FALCO BIARMICUS BIARMICUS Temminck

Falco biarmicus Temminck, 1825, Pl. Col., livr. 55, pl. 324: Caffraria and Cape of Good Hope, South Africa.

♀ (M. C. Z. 148,223) Unyanganyi, Turu. 7. xii. 29.

Parasites. Tapeworms (*Dispharynx* sp) were found in the stomach of this South African Lanner.

* FALCO SUBBUTEO SUBBUTEO Linnaeus

Falco subbuteo Linnaeus, 1758, Syst. Nat., 10th ed., p. 89: Europe.

♂ ♀ (M. C. Z. 148,224-5) Saranda, Ugogo. 17. xii. 29.

Parasites. Nematodes (*Habronema leptoptera*) were recovered from the stomach of one of these Hobbies.

FALCO TINNUNCULUS CARLO (Hartert & Neumann)

Cerchneis tinnunculus carlo Hartert & Neumann, 1907, Journ. f. Orn., p. 592: Bissidimo, near Harrar, Ethiopia.

3 ♂ 2 ♀ (M. C. Z. 148,226-30) Ujiji, Lake Tanganyika. 23-26. v. 30.

Habitat. These are characteristic examples of the African Mountain Kestrel, which we were rather surprised to find in such a locality. They were killed with three shots as they were perched in a tall palm growing among the ruins of the Usagara building in the native town.

Variation. One male is noticeably lighter than the other four birds.

*FALCO NAUMANNI NAUMANNI Fleischer

Falco naumanni Fleischer, 1818, in Laurop & Fischer's *Sylvan* for 1817-1818, p. 174: southern Germany.

♂ ♀ ♀ (M. C. Z. 148,231-3) Ilolo, Rungwe. 15. iv. 30.

FALCO ARDOSIACEUS Bonnaterre & Vieillot

Falco ardosiaceus Bonnaterre & Vieillot, 1823, *Encycl. Méth. Orn.*, pt. 3, p. 1238: Senegal.

? sex (M. C. Z. 148,234) Ukerewe Id., Lake Victoria. 17. vi. 30.

Parasites. Lice were recovered from the plumage of this Gray Kestrel.

MILVUS MIGRANS PARASITUS (Daudin)

Falco parasitus Daudin, 1800, *Traité d'Orn.*, 2, p. 150: South Africa.

♂ (M. C. Z. 148,235) Unyanganyi, Turu. 4. xii. 29.

♂ (M. C. Z. 148,236) Madehani, Ukinga Mtns. 22. ii. 30.

♀ (M. C. Z. 148,237) Shinyanga, Usukuma. 3. vi. 30.

Native names. *Ngama* (Kikinga); *lieve* (Kinyakusa).

These African Black Kites were shot when they began to take too great an interest in the skins of the small mammals which were drying in the open.

Folklore. An old Mnyakusa at Ilolo at the foot of Rungwe Mountain related the following story to me in explanation of the fact that kites sometimes kill chickens.

"Once upon a time the kite and the fowl were friends until one day when the fowl went to borrow a hatchet from the hawk. With the hatchet he went to the forest to cut some firewood, but in doing so lost the hatchet. The fowl returned to his friend to report the loss, expressed his regrets and said, 'Until I return it you are at liberty to take one of my children when you want one.' To this day the hatchet has never been found."

ELANUS CAERULEUS CAERULEUS (Desfontaines)

Falco caeruleus Desfontaines, 1789, *Hist. (i. e. Mém.) Acad. Roy. Paris*, for 1787, p. 503: near Algiers.

♀ (M. C. Z. 148,238) Madehani, Ukinga Mtns. 26. ii. 30.

♂ (M. C. Z. 148,239) Ilolo, Rungwe. 3. iv. 30.

♀ (M. C. Z. 148,240) Ujiji, Lake Tanganyika. 23. v. 30.

Native names. *Kikurwiwi* (Kikinga); *akapula* (Kinyakusa & Kinyika).

Parasites. Nematodes (*Habronema* sp. and *Physaloptera* sp.) were recovered from the stomach of the Iloilo specimen of the Black-shouldered Kite.

AQUILA RAPAX RAPAX (Temminck)

Falco rapax Temminck, 1828, Pl. Col. livr. 76, pl. 455: South Africa.

♂ (M. C. Z. 148,241) Shinyanga, Usukuma. 2. vi. 30.

This Tawny Eagle was shot while resting in a baobab tree in open grasslands.

Parasites. Tapeworms (*Schiztocephalus solidus*) were recovered from its stomach.

STEPHANOÆTUS CORONATUS (Linnaeus)

Falco coronatus Linnaeus, 1766, Syst. Nat. 12th ed., p. 124: Guinea (i. e. West Africa).

♀ (M. C. Z. 148,242) Kigogo, Uzungwe Mtns. 31. i. 30.

♀ (M. C. Z. 148,243) Nkuka Forest, Rungwe Mtn. 7. iv. 30.

Native name. *Masimula* (Kinyakusa).

Diet. In the stomach of the Crowned Hawk-Eagle from Kigogo were bones and fur of a monkey (*Cercopithecus leucampyx molinoi*) while the Rungwe bird was one of a pair which were engaged in eating a colobus monkey (*Colobus polykomos sharpei*); a full account of the relations of colobus and eagle will be found in the report dealing with the mammals collected on the expedition.

LOPHAÆTUS OCCIPITALIS (Daudin)

Falco occipitalis Daudin, 1800, Traité, 2, p. 40: the Anteniquoi country, i. e. Knysna district, Cape Province, Cape Colony.

♂ (M. C. Z. 148,244) Kigogo, Uzungwe Mtns. 13. i. 30.

♀ (M. C. Z. 148,245) Mwaya, Lake Nyasa. 4. iii. 30.

♀ (M. C. Z. 148,246) Ukerewe Id., Lake Victoria. 13. vi. 30.

Native name. *Mquali* (Kikerewe).

Parasites. Tapeworms were collected from the stomach of the Ukerewe Id. example of the Long-crested Hawk-Eagle.

CUNCUMA VOCIFER VOCIFER (Daudin)

Falco vocifer Daudin, 1800, *Traité*, 2, p. 65: Keurboom River, Cape Province, Cape Colony (ex. Levaillant).

♂ (M. C. Z. 148,247) Ujiji, Lake Tanganyika. 24. v. 30.

♀ (M. C. Z. 148,248) Ukerewe Id., Lake Victoria. 16. vi. 30.

Native name. *Mpungu* (Kikerewe).

Measurements. The wings of the adult male measure 555 mm. and thus conform to that given for the typical form.

Breeding. To the north of Ujiji Bay are the conglomerate cliffs of Bangwe headland which I visited on May 28, 1930. From one of the cliffs was growing a small tree which was about thirty feet from the top of the cliff and fifty feet from the bottom. Its roots reached down over the face of the cliff which was sheer. By climbing into another tree growing at the base of the cliff and thence to the roots of the tree growing from the cliff face, Salimu was able to ascend to where there was a large nest of sticks which I had observed from the dugout canoe in which we were cruising up the coast. Salimu reported that the nest was lined with water weeds of a type which are washed up in considerable quantities all along this shore; furthermore there were several globular nests of weaver birds which had also been utilized for a lining. The nest did not appear to have been recently constructed but contained a full clutch comprised of two perfectly fresh eggs of a uniform white exterior. These eggs measured 76 x 56 mm. and 75 x 55 mm. respectively.

I had seen the parent birds leave trees at the summit of the cliff and during the half hour which we spent in the vicinity of the nest they remained quietly perched in trees just out of sight on the northern aspect of the headland.

The female bird listed above was brought to me alive; it was a fledgling only just able to fly. I put a ring round its leg and tethered it. For several days it fed on fish, meat and the eggs of a Nile Monitor lizard until one day, when it broke its leg in flying from its perch. Thereafter it refused food, so I shot it and preserved the skin.

Dict. The stomach of the Ujiji bird held a fish.

Parasites. The plumage of the Ukerewe African Sea Eagle was swarming with lice which were preserved.

GYPOHIERAX ANGOLENSIS (Gmelin)

Falco angolensis Gmelin, 1788, Syst. Nat., 1, p. 252: Angola.

♀ (M. C. Z. 148,249) Ujiji, Lake Tanganyika. 28. v. 30.

Diet. When we were returning from Bangwe cliffs in a dugout canoe, this Vulturine Fish-Eagle came flying towards us and I brought it down with No. 3 shot. In its gullet were quantities of the fruit of the oil palm. I showed these to Herr Wolfe, who was staying in Ujiji at the time, and he told me that he had also shot these birds and found that they had fed upon palm nuts. I thought this a remarkable observation but in consulting Bannerman's Birds of Tropical West Africa, 1930, p. 273, on my return home, found that it was a well established fact.

BUTEO BUTEO VULPINUS (Gloger)

Falco vulpinus Gloger, 1833, Abänd. Vög. durch Einfl. des Klima's, p. 141: Africa ex. Licht. MS. in Berlin Mus.

♂ (M. C. Z. 148,250) Madehani, Ukinga Mtns. 14. ii. 30.

Native name. Ruele (Kikinga).

Diet. The stomach of this Steppe Buzzard held grasshoppers and a very large caterpillar.

Habitat. Shot from a low tree in cattle pasture close to the village.

BUTEO OREOPHILUS Hartert & Neumann

Buteo oreophilus Hartert & Neumann, 1914, Orn. Monatsb., 22, p. 31: Koritscha, southern Ethiopia.

♂ (M. C. Z. 148,251) Kigogo, Uzungwe Mtns. 14. i. 30.

Diet. The horn of a chameleon (*Chamaeleon werneri werneri*) was found in the stomach of this Mountain Buzzard.

Parasites. Lice were numerous in its neck feathers while nematodes (*Porrocaecum* sp.) were recovered from its stomach.

ACCIPITER¹ BADIUS POLYZONOIDES Smith

Accipiter polyzonoides Smith, 1838, Ill. Zoöl. S. Afr., 2, pl. ii: "N. of 26° S. lat.," probably near Mafeking, Cape Colony.

♀ (M. C. Z. 148,252) Kigogo, Uzungwe Mtns. 28. i. 30.

¹ Astur of Sclater and auct.

ACCIPITER TACHIRO SPARSIMFASCIATUS (Reichenow).

Astur sparsimfasciatus Reichenow, 1895, Orn. Monatsber., 3, p. 97: Zanzibar.

♀ (M. C. Z. 148,253) Dabaga, Uzungwe Mtns. 2. i. 30.

♀ (M. C. Z. 148,254) Kigogo, Uzungwe Mtns. 24. i. 30.

♀ (M. C. Z. 148,255) Kasanga, Lake Tanganyika. 16. v. 30.

Native name. Lutema (Kihehe).

Variation. All three examples of the East African Goshawk are somewhat intermediate between *A. t. sparsimfasciatus* of Zanzibar and *A. t. tachiro* of Knysna, South Africa.

Diet. The feathers of a small bird and remains of a chameleon (*Chamaeleon tempeli*) were recovered from the stomach of the Dabaga *Accipiter* while that of the Kigogo hawk held mouse fur.

As we entered one of the back streets of Kasanga on our return from Kitungulu, a goshawk swooped down upon a full-grown native fowl, rose with it four feet from the ground, then, as the fowl cackled and vigorously flapped her wings, dropped its prey and rose to perch in a mango tree close by. Salimu shot it and we found on subsequent dissection that its stomach was empty.

Parasites. Lice were found in the plumage of the Kigogo bird.

MELIERAX METABATES MECHOWI Cabanis

Melierax mechowi Cabanis, 1882, Journ. f. Orn., p. 229: Melandje (= Malanji), Angola.

♀ (M. C. Z. 148,256) Shinyanga, Usukuma. 3. vi. 30.

The junior author observed this bird float up to a baobab tree which was standing in open grass country. As he approached she distinctly settled down on a nest in the tree. A native was sent up and reported the nest an old one and empty. I then shot the bird.

PHASIANIDAE

FRANCOLINUS COQUI HUBBARDI Grant

Francolinus hubbardi Ogilvie-Grant, 1895, Bull. Brit. Orn. Cl., 4, p. xxvii: Nassa, southeast shore of Victoria Nyanza, Tanganyika Territory.

♀ (M. C. Z. 148,257) Unyanganyi, Turu. 7. xii. 29.

Parasites. A nematode worm (*Heterakis* sp. ? *longicauda*) was found in the stomach of this Hubbard's Coqui.

Enemies. This bird was purchased from a native who had snared it.

FRANCOLINUS SEPHAENA GRANTII Hartlaub

Francolinus grantii Hartlaub, 1866, Proc. Zoöl. Soc. London for 1865, p. 665, pl. xxxix, fig. 1: Unyamwezi, Tanganyika Territory.

♂ ♂ ♀ ♀ (M. C. Z. 148,258-61) Saranda, Ugogo. 29. xi. & 17. xii. 29.

Habits. Grant's Crested Francolin always goes in threes while *Pternistes cranchii itigi*, feeding over the same ground, is only to be seen in pairs, as far as my experience goes.

Parasites. Lice were recovered from the plumage of one of these birds.

FRANCOLINUS sp.

Breeding. While engaged in spooring a wounded leopard on Ukerewe Island on June 18, 1930, we disturbed a pair of francolins in a dense thorn thicket on the side of a rocky hill; later a native went in and brought out a single, perfectly fresh egg measuring 46 x 35 mm. No francolins were shot during our short stay on the island, but they were seen flying over the bush on several occasions. Doubtless the presence of large numbers of small carnivores accounts for the exceptionally secretive behaviour of the francolins upon the island; daily at dusk they might be heard calling from afar but on going to the place one always found that the birds were calling from dense and humanly impenetrable thickets. As, however, only two species of francolin are said to occur upon the island (one of which is, I believe, the small *F. c. hubbardi*) it should not be difficult to identify this egg in course of time.

FRANCOLINUS SQUAMATUS UZUNGWENSIS Bangs & Loveridge

Francolinus squamatus uzungwensis Bangs & Loveridge, 1931, Proc. New Eng. Zoöl. Club, 12, p. 93: Kigogo, Tanganyika Territory.

♂ (M. C. Z. 148,262) Kigogo, Uzungwe Mtns. 30. i. 30.

Habits. This francolin occurred within, as well as on the outskirts of, the rain forest at Kigogo. The birds were very secretive, remaining quiescent until one was within a few feet of them, when they would take to wing with startling suddenness, flying in and out of the bushes and trees in a manner which made it almost impossible to shoot. They could hardly be considered abundant, for not more than half a dozen pairs were seen during the three weeks of daily collecting which we spent at Kigogo; possibly the same pair was seen on several occasions.

PTERNISTES CRANCHII ITIGI Bowen

Pternistes cranchii itigi Bowen, 1930, Proc. Acad. Nat. Sci. Phila., **82**, p. 86: Gwao's Village, Itigi, Tanganyika Territory.

♂ (M. C. Z. 148,263) Unyanganyi, Turu. 6. xii. 29.

♂ (M. C. Z. 148,264) Mangasini, Usandawi. 12. xii. 29.

♀ (M. C. Z. 148,265) Saranda, Ugogo. 29. xi. 29.

The skins listed above have been compared with three specimens in the Museum of Comparative Zoölogy identified by Mr. Wedgewood Bowen when describing this strongly marked form.

Parasites. Nematodes were found in the Saranda spurfowl.

PTERNISTES CRANCHII INTERCEDENS Reichenow

Pternistes cranchi intercedens Reichenow, 1909, Orn. Monatsb., **17**, p. 88: Lake Rukwa, Tanganyika Territory.

♀ (M. C. Z. 148,264) Tandala, Ukinga Mtns. 11. ii. 30.

5♂ 2♀ (M. C. Z. 148,265-73) Mwaya, Lake Nyasa. 6-8. iii. 30.

5♂ (M. C. Z. 148,274-8) Ilolo, Rungwe. 5-18. iv. 30.

Native names. *Nerekere* (Kikinga); *Ingwale* (Kinyakusa).

Variation. The Tandala bird is immature and its race is consequently assumed on geographical grounds. One or two of the Mwaya birds are brighter than any of the Ilolo series.

Breeding. At Mwaya, on March 7, 1930, three recently hatched young were offered for sale but not purchased.

Distribution. All three localities from which this material was obtained lie but a hundred miles or so to the southwest of the type locality — Lake Rukwa.

Habitat. The Mwaya birds were shot in the native gardens on the outskirts of the village. Here they were very abundant and started calling about an hour before sunset each evening. The birds were in pairs, unaccompanied by young, and were comparatively bold. The Ilolo series was secured in the cleared lands of the Rungwe Mission plantations on the lower slopes of Rungwe Mountain.

NUMIDA MELEAGRIS MITRATA Pallas

Numida mitrata Pallas, 1767, Spic. Zoöl., **1**, fasc. iv, pl. iii: Madagascar.

♂ (M. C. Z. 148,279) Mwaya, Lake Nyasa. 3. iii. 30.

Native name. *Ilikanga* (Kinyakusa).

Affinities. Bannermann (1930, Birds of Tropical West Africa, i, footnote to p. 347) has given cogent reasons for considering that

all the races hitherto considered forms of *mitrata* should be included as forms of *meleagris* which is the older name.

Breeding. At Mwaya, on March 8, 1930, a native came up to me saying that he had some eggs for sale. I referred him to the cook who did the buying for the commissariat. Later three eggs arrived on the table with a curry; after dinner the cook enquired whether they had been all right as they were guinea fowl eggs. I was horrified to learn that I had ruined a clutch of ten in this way and sent for the remaining seven eggs which I promptly blew as specimens, though their contents afterwards furnished a savoury omelet! It was some consolation to find the shells of these eggs unusually hard; even with the assistance of a file to start a drill hole, the drilling was quite a task. The eggs measured 50 x 37 mm. and were quite typical — white, but so heavily overlaid with buff as to almost exclude the white; the surface was glossy and minutely pitted.

NUMIDA MELEAGRIS REICHENOWI Grant

Numida mitrata reichenowi Ogilvie-Grant, 1894, Ibis, p. 536: Makarungu, Ukamba district, Kenya Colony.

♂ ♂ (M. C. Z. 148,280-1) Unyanganyi, Turu. 5. xii. 29.

♀ (M. C. Z. 148,282) Ukerewe Id., Lake Victoria. 10. vi. 30.

Coloration. The young female from Ukerewe Island is identified with some misgivings as the coloration of the soft parts seemed to the collector to be different from his recollections of such coloring in *reichenowi*. This coloration may be due to its immaturity.

NUMIDA MELEAGRIS UHEHENSIS Reichenow

Numida uhehensis Reichenow, 1898, Orn. Monatsb., p. 88: Uhehe, Tanganyika Territory.

♂ (M. C. Z. 148,283) Dabaga, Uzungwe Mtns. 27. xii. 29.

Affinities. Though considered by Sclater to be a doubtful form, this almost topotypic specimen of the Uhehe Helmet-Guinea fowl leads us to regard the race as recognisable.

NUMIDA MELEAGRIS RIKWAE Reichenow

Numida rikwae Reichenow, 1900, Orn. Monatsb., 8, p. 40: southern shore of Lake Rukwa, Tanganyika Territory.

♂ ♂ ♀ (M. C. Z. 148,284-6) Kipili, Ufipa. 19. v. 30.

Native name. Ikanga (Kifipa).

Coloration. The collector was struck by the very different coloration of the skin of the head to that of any guinea fowl with which he was familiar. This is another form which Sclater considers doubtful but the small rounded helmets are totally different from those of the *mitrata* in our series. While our birds are obviously identical with *frommi* Kothe (1911) from the west shore of Rukwa, that form is hardly likely to be distinct from *rikwae*.

Distribution. Kothe not only referred Uanda birds to *frommi* but a series collected by Capt. Fromm at Mbuga and Mfile, Ufipa which is close to the locality from which the above mentioned birds come.

Two of these guinea fowl were shot as they paused at the edge of Lake Tanganyika, having come down to drink after sunset.

GUTTERA EDWARDI GRANTI (Elliot)

Numida granti Elliot, 1871, Proc. Zool. Soc. London, p. 584: Ugogo, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,287-8) Saranda, Ugogo. 19. xii. 29.

Affinities. Though Sclater considers *granti* a doubtfully distinct form we have compared these skins with examples of *Guttera pucherani* from Taveta, Kenya Colony and find them strikingly different. Our topotypes of *granti* are much darker birds, less bluish and with a shorter crest. We also have compared them with *G. e. edwardi*, *G. e. sethsmithi* and *G. sclateri*, from all of which they differ in the much smaller extent of the black collar on the chest, as well as in the general coloration.

Habitat. Crested Guinea fowl are not uncommon at Saranda, where the junior author obtained two alive in 1926 for the Smithsonian-Chrysler Expedition. In 1922 his collector, Salimu, preserved three from Mahaka not far from Saranda; these were presented to Tring Museum. Three birds belonging to this race were seen at Kidete in 1923.

They are, however, extremely wary at Saranda and, though sought for daily during the first week spent in the vicinity of Saranda, none were obtained. On the last morning of our return visit we had only three shot-gun cartridges left. These I gave to Salimu, who departed with his brother before daybreak while I busied myself with packing for the journey to Kikuyu. Salimu returned at 9 a.m. with the pair of birds listed above. He lost the third cartridge while crawling through the undergrowth!

RALLIDAE

CRECOPSIS EGREGIA (Peters)

Ortygometra (Crex) egregia Peters, 1854, Monatsb. Akad. Wiss. Berlin, p. 134: Tete, Zambesi, Mozambique.

♀ (M. C. Z. 148,289) Saranda, Ugogo. 30. xi. 29.

♀ (M. C. Z. 148,290) Mwaya, Lake Nyasa. 7. iii. 30.

Breeding. The Mwaya bird was apparently breeding for the ovules were enlarged.

SAROTHRURA sp.

Fully half a dozen crane were seen during the stay at Kigogo, Uzungwe Mountains. None were obtained owing to their peculiar habits. They remained quiescent in the knee-high grass until almost trodden upon then, rising with a somewhat snipe-like flight, they would fly only twenty or thirty feet away to drop as suddenly as they had risen. Apparently, immediately on landing, they run off at full speed for all attempts to surround them failed as inevitably as endeavors to discover them by quiet stalking and search at the point where they had dropped. Never more than one bird was flushed at a time (January, 1930), and had one fired at such short range the probability would have been that the tiny bird would have been blown to pieces.

GALLINULA ANGULATA Sundevall

Gallinula angulata Sundevall, 1850, Oefv. Vet.-Akad. Förh. Stockholm, p.110: lower Caffraria, i. e. Natal.

Sex ? (M. C. Z. 148,291) Entebbe, Uganda. 28. vi. 30.

This Lesser Moorhen was brought to me by a native who had snared it.

BALEARICIDAE

BALEARICA PAVONINA GIBBERICEPS Reichenow

Balearica gibbericeps Reichenow, 1892, Journ. f. Orn., p. 126: Lake Jipé, near Kilimanjaro, Tanganyika Territory.

♂♂ ♀♀ (M. C. Z. 148,292-5) Unyanganyi, Turu. 6. xii. 29.

Diet. Salimu had just shot one of these cranes at Unyanganyi on December 6, 1929, when a native came up to me and said that he

wished I would come and shoot three of the birds which were eating *matama* seed that he had only sown the previous day. I accompanied him to his *shamba* where the three birds were feeding along in a row, all three were killed with a right and left barrel as they rose. In their stomachs were a great many white beads, besides a quantity of seeds. These were submitted to Dr. J. F. V. Phillips, ecologist of the Tsetse Investigation Department, but up to the time of going to press no report has been received upon them.

Parasites. Lice were recovered from their plumage. No parasites were detected in their stomachs.

BALEARICA PAVONINA REGULORUM (Bennett)

Anthropoides regulorum Bennett, 1833, Proc. Zoöl. Soc. London, p. 118: South Africa.

Breeding. At Mwaya, on March 4, 1930, I was wading about in a foot of water in a vast swamp that was much frequented by waterfowl and waterbuck, when a Crowned Crane rose from its nest, within six feet of me. The nest, at most a couple of feet in diameter, was a loose assemblage of dead sedges rising about a foot above the surrounding water level. It held three large chalky white eggs but with a hard surface and measuring 80 x 60 mm.; these eggs were in an advanced stage of incubation. The bird flew off and did not return. Mr. A. H. Paget Wilkes (1928, *Bateleur*, 1, p. 9) has given an excellent and detailed account of the nesting of the East African race at Kitale, Kenya Colony on September 17, 1928, at which time a clutch of two eggs were slightly incubated.

CHARADRIIDAE

STEPHANIBYX CORONATUS CORONATUS (Boddaert)

Charadrius coronatus Boddaert, 1783, Tabl. Pl. Enlum., p. 49: Cape of Good Hope, South Africa (ex Daubenton).

♂ ♀ (M. C. Z. 148,296-7) Shinyanga, Usukuma. 3. vi. 30.

Native name. *Tuletule* (Kikerewe)

Habitat. These Crowned Lapwings were shot on the bush-grown flats lying between Old Shinyanga and New Shinyanga; several other pairs were seen.

GLAREOLIDAE

CURSORIUS TEMMINCKII TEMMINCKII Swainson

Cursorius temminckii Swainson, 1822, Zoöl. Illustr., 2, pl. 106: Senegal (cf. Swainson, 1837, B. W. Afr., 2, p. 230).

♂ (M. C. Z. 148,298) near Idewa, Uzungwe Mtns. 6. i. 30.

Habitat. One of a pair which rose from short grass on the hillside; these were the only Temminck's Coursers seen in the mountains.

BURHINIDAE

BURHINUS CAPENSIS CAPENSIS (Lichtenstein)

Oedicnemus capensis H. Lichtenstein, 1823, Verz. Doubl. Mus. Berlin, p. 69: Cape of Good Hope, South Africa.

♂ ♀ (M. C. Z. 148,299-300) near Njombe, Ubena Mtns. 6-7. ii. 30.

Habits. Shot at night on the track between Malangali and Njombe where they were quite abundant. The driver of the lorry told me that they are frequently so dazed by the lights of the car that he runs over them; suiting the action to the word, and before I could stop him, he drove over one crushing its head completely. The natives who accompanied us decapitated it in accordance with Mohammedan law, after which they ate it.

BURHINUS VERMICULATUS VERMICULATUS (Cabanis)

Oedicnemus vermiculatus Cabanis, 1868, Journ. f. Orn., p. 413: East Africa. i. e. Lake Jipé, near Kilimanjaro, Tanganyika Territory (vide Finsch & Hartl., Vög. Ostaf., p. 623).

♂ ♀ (M. C. Z. 148,301-2) Ujiji, Lake Tanganyika. 28. v. 30.

Habitat. Shot on a pebble-covered beach between Ujiji and Bangwe.

Parasites. Lice were recovered from the plumage of one of these Water Dikkops.

JACANIDAE

ACTOPHILORNIS AFRICANUS (Gmelin)

Parra africana Gmelin, 1789, Syst. Nat., 1, pt. 2, p. 709: Africa; restricted type locality, Ethiopia (Grant, 1915, Ibis, p. 59).

♂ ♀ (M. C. Z. 148,303-4) Ujiji, Lake Tanganyika. 24. v. 30.

Habitat. Lily-Trotters were very plentiful on the lily pads growing in the bays and lagoons just south of Ujiji.

LARIDAE

LARUS CIRROCEPHALUS POICEPHALUS Swainson

Larus poicephalus Swainson, 1837, Birds W. Afr., 2, p. 245: no type locality; probably West Africa.

♀ (M. C. Z. 148,305) Kalambo River Mouth, Lake Tanganyika. 12. v. 30.

Breeding. I was asked by several persons, including Capt. Sharpe of the S.S. *Liemba*, where these birds bred, as no one had ever found them nesting in the vicinity of the lake. It seemed to me that a suitable site would be in the seclusion of the vast swamps and reed-beds just south of Ujiji; possibly they join the birds on Naivasha, which is a well known breeding haunt. In May they were in flocks, and the above specimen was shot from a flock resting on the sandbar which projects into the lake.

Diet. In its crop was a quantity of small fish (*Lamprichthys tanganyicae*), identified for us by Dr. N. Borodin.

COLUMBIDAE

COLUMBA ARQUATRIX ARQUATRIX Temminck & Knip.

Columba arquatrix Temminck & Knip, 1809, Pigeons, Colombes, p. 11, pl. 5: "d'Anteniquoi" i. e. Knysna, Cape Province, South Africa.

♂ ♀ (M. C. Z. 148,306-7) Kigogo, Uzungwe Mtns. 17. i. 30.

♂ ♀ ♀ (M. C. Z. 148,308-10) Nkuka Forest, Rungwe Mtn. 25. iii-S. iv. 30.

Native names. *Isele* (Kinyakusa); *inzungumi* (Kinyika).

STREPTOPELIA LUGENS (Rüppell)

Columba lugens Rüppell, 1837, N. Wirbelth. Vög., p. 64, pl. 22, fig. 2: Ethiopian highlands.

Streptopelia lugens Friedmann, 1929, U. S. Nat. Mus. Bull. 153, pp. 213-216.

♂ (M. C. Z. 148,311) Igale, Poroto Mtns. 28. iv. 30.

Affinities. We accept Friedmann's conclusions as set forth in the paper cited above, in not recognising *funebrea* van Someren (Elgon) as a southern race of the Abyssinian Pink-breasted Turtle-Dove.

STREPTOPELIA SEMITORQUATA SEMITORQUATA (Rüppell)

Columba semitorquata Rüppell, 1837, Neue Wirbelth. Vög., p. 66, pl. 23, fig. 2: Taranta Mtns., Ethiopia.

♀ (M. C. Z. 148,312) Madehani, Ukinga Mtns. 21. ii. 30.

♂ ♂ ♀ (M. C. Z. 148,313-5) Ilolo, Rungwe. 8. iv. 30.

Native names. *Nuta* (Kikinga); *ngunguwia* (Kinyakusa); *gunguwija* (Kinyika).

STREPTOPELIA DECIPIENS PERSPICILLATA (Fischer & Reichenow)

Turtur perspicillata Fischer & Reichenow, 1884, Journ. f. Orn., **32**, p. 179: Nguruman, Lake Natron, Tanganyika Territory.

♂ (M. C. Z. 148,316) Shinyanga, Usukuma. 3. vi. 30.

Native name. *Kisanga* (Kikerewe).

STREPTOPELIA CAPICOLA ANCEPS Friedmann

Streptopelia capicola anceps Friedmann, 1928, Proc. New Eng. Zool. Club, **10**, pp. 67-68: Kilosa, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,317-8) Ukerewe Id., Lake Victoria. 12. vi. 30.

Native name. *Serawituta* (Kikerewe).

STIGMATOPELIA SENEGALENSIS AEQUATORIALIS (Erlanger)

Turtur senegalensis aequatorialis Erlanger, 1904, Orn. Monatsb., p. 98: Menaballa, Ethiopia.

♂ (M. C. Z. 148,319) Mwanza, Lake Victoria. 9. vi. 30.

TYMPANISTRA TYMPANISTRA FRASERI Bonaparte

Tympanistra fraseri Bonaparte, 1855, Consp. Av., 2, p. 67: Fernando Po.

♂ (M. C. Z. 148,320) Nkuka Forest, Rungwe Mtn. 10. iv. 30.

Native name. *Kapumbuhili* (Kinyika).

APLOPELIA LARVATA LARVATA (Temminck & Knip)

Columba larvata Temminck & Knip, 1810, Pigeons, Colombes, p. 71, pl. 31: "d'Anteniquoi" i. e. Knysna, Cape Province, South Africa.

♂ ♀ (M. C. Z. 148,321-2) Nkuka Forest, Rungwe Mtn. 8-9. iv. 30.

Native name. *Kakuguwickenandi* (Kinyika).

Habitat. Not infrequently encountered feeding upon the forest floor but difficult to shoot on account of the dense undergrowth through which, however, they are expert in flying away.

VINAGO CALVA SALVADORII Dubois

Vinago calva salvadorii Dubois, 1897, Proc. Zoöl. Soc. London, p. 784: eastern and central tropical Africa; restricted type locality, western shores of Lake Tanganyika (Hartert).

♂ ♀ (M. C. Z. 148,326-7) Kigogo, Uzungwe Mtns. 13-15. i. 30.

Breeding. At Ipemi, Uzungwe Mtns., on January 8, 1930, a Green Pigeon, not necessarily this race, fluttered down from a branch just above my head, and flew slowly away almost into the grass. Such behaviour being unusual for so swift a bird, I looked up and saw a flimsy nest, or what remained of one, depending from a branch, while in the fork from which it had presumably been dislodged, crouched two very small nestlings, side by side, upon a branch which was only nine feet above the ground.

Parasites. Nematodes (*Ascaridia fasciata*) and trematodes were recovered from the stomachs of these birds.

Distribution. The above records constitute a considerable extension of the range of this race in a southeasterly direction.

VINAGO CALVA GRANVIKI Grote

Vinago calva granviki Grote, 1924, Journ. f. Ornith., p. 102: Ukerewe Id., Victoria Nyanza; Tanganyika Territory.

♂ ♂ (M. C. Z. 148,328-9) Unyanganyi, Turu. 4. xii. 29.

VINAGO DELALANDII DELALANDII (Bonaparte)

Phalacrotreron delalandii Bonaparte, 1854, Comptes Rendu, **39**, p. 873: Port Natal, i. e. Durban, Natal.

♀ ♀ (M. C. Z. 148,323-4) Kigogo, Uzungwe Mtns. 18. i. 30.

Affinities. If *granti* van Someren (Kilwa, T. T.) can be recognised as a valid subspecies, and Sclater has done so (1930, Syst. Avium Aethiop., p. 850), then possibly these Green Pigeons should be referred to that race, but as far as our material shows, they are wholly similar to the birds of our South African series.

VINAGO WAKEFIELDII WAKEFIELDII (Sharpe)

Treron wakefieldii Sharpe, 1874, Proc. Zoöl. Soc. London for 1873, p. 715, pl. 58, fig. 2: Mombasa, Kenya Colony.

♀ (M. C. Z. 148,325) Ilolo, Rungwe district. 18. iv. 30.

Distribution. The range of the typical form of Wakefield's Green Pigeon is given by Sclater as "The eastern portion of Kenya Colony south to the Pangani." Four specimens from the Usambara Mountains have been compared with our Ilolo bird, and there is no appreciable difference, though this fresh record constitutes a considerable extension of its previously recognised range.

CUCULIDAE

CUCULUS SOLITARIUS Stephens

Cuculus solitarius Stephens, 1815, in Shaw's Genl. Zoöl., **9**, p. 84, pl. 18: Caffraria, i. e. eastern Cape Province, South Africa (ex Levaillant).

♀ (M. C. Z. 148,330) Kigogo, Uzungwe Mtns. 16. i. 30.

CUCULUS CLAMOSUS Latham

Cuculus clamosus Latham, 1802, Genl. Syn., **2**, Suppl., p. xxx: Cape of Good Hope, South Africa.

♂ (M. C. Z. 148,331) Bagamoyo. 14. xi. 29.

PACHYCOCCYX VALIDUS (Reichenow)

Cuculus validus Reichenow, 1879, Orn. Centralb., p. 139: Muniuni, Tana River, Kenya Colony.

♀ (M. C. Z. 148,332) Bagamoyo. 14. xi. 29.

Distribution. This additional record of the occurrence of the rare

Thick-billed Cuckoo right on the east coast is of particular interest. It was shot in open forest about two miles west of the Ruvu River or about five miles from the coast. Another example in the Museum of Comparative Zoölogy (M. C. Z. 233,500) comes from Mogogoni, which is also on the Ruvu River but some forty-five miles farther south.

CLAMATOR GLANDULARIUS (Linnaeus)

Cuculus glandularius Linnaeus, 1758, Syst. Nat., 10th ed., p. 111: North Africa and southern Europe.

♀ (M. C. Z. 148,333) Unyanganyi, Turu. 5. iii. 29.

Breeding. At Unyanganyi, on December 4, 1930, I observed a crow (*Corvus albus*) driving a kite away from a baobab tree, which was in flower and just breaking into leaf. Later, from afar, I saw a crow settling on a nest and the male perched close by. Despite three bees' nests in the tree, Salimu went up and brought down an extraordinary clutch of seven eggs! Two were obviously crow's eggs and measured 46 x 31 mm. and 45 x 29 mm.; five others were very similar in color and markings but were much smaller, four of them measuring 31 x 25 mm., while the fifth, which appeared addled, was only 29 x 36 mm.; the four larger eggs held developing young, while those of the crow were less well developed.

The next morning Salimu shot a Great Spotted Cuckoo in the vicinity and in her oviduct was a pigmented egg exactly like the five smaller eggs from the crow's nest, which settled any doubts as to the identity of the five small eggs which the crow had been brooding. The egg from the oviduct was unfortunately broken but was preserved in alcohol.

Later the same morning, at 10 a.m. to be precise, I saw a pair of these cuckoos fly into a fig tree above my tent. When they flew from this tree they separated, the male (?) going to a leafless baobab fifty yards or so from the tent while the second bird, which I presume was the hen, flew on to the baobab in which was the rifled nest. Though I watched the nest carefully through my field glasses, my view was considerably obstructed by foliage and I was unable to see if the cuckoo went on to it. After waiting for a quarter of an hour I approached the tree as an Augur Buzzard (*Buteo rufofuscus augur*) had settled just above the nest; as I approached, the cuckoo flew away and joined its companion in the defoliated baobab. No sooner

had I reached my tent, however, than it returned to the tree which held the nest. I sat down to write up these notes when at 10.55 a.m. I was disturbed by five crows flying about the nest with much cawing; three settled in the tree in the vicinity of the nest, then two of them flew away, leaving one perched close to the nest. Last thing before we left Unyanganyi on the ninth, Salimu reëxamined the nest, but it was still empty. Whether the cuckoo had placed an egg in the nest and this had roused the curiosity of the five crows and one had eaten it is purely a matter of conjecture.

Dr. V. G. L. van Someren and Dr. H. Friedmann inform me that this is the first record of a Great Spotted Cuckoo laying in East Africa, though Sir Charles Belcher tells me that a single egg has been taken in Nyasaland.

LAMPROMORPHA CAPRIUS (Boddaert)

Cuculus caprius Boddaert, 1783, Tabl. Pl. Enlum., p. 40, no. 657: Cape of Good Hope, South Africa.

? (M. C. Z. 148,334) Mwera, Zanzibar. 21-24. x. 29.

♂ (M. C. Z. 148,335) Ujiji, Lake Tanganyika. 28. v. 30.

♂ (M. C. Z. 148,336) Ukerewe Id., Lake Victoria. 11. vi. 30.

Native name. *Insequ* (Kikerewe).

Habitat. The Didric Cuckoo from Ujiji was shot in some bushes overhanging the lake, into which it fell; the adjacent bushes were loaded with the nests of weaver birds.

CENTROPUS SUPERCILIOSUS LOANDAE Grant

Centropus superciliosus loandae Grant, 1915, Bull. Brit. Orn. Club, **33**, p. 54: near Dalla Tando, North Angola.

♂ ♀ (M. C. Z. 148,337-8) Mwaya, Lake Nyasa. 3-10. iii. 30.

Native name. *Ingyoholibo* (Kinyakusa).

Breeding. At Ujiji, Lake Tanganyika, on May 26, 1930, I refused to purchase a fledgling of the Central African White-browed Coucal, which was brought to me by a native child who had found it near my camp.

At Ukerewe Island, Lake Victoria, on June 13, 1930, a native showed me a nest of one of these coucals. It had been built at a height of four feet from the ground against a slight shrub; the shrub was enveloped in rank grass and sedge some seven feet high. The structure, which hardly merits the name of a nest so loosely is it put

together, was constructed of dry sedges bent in an oval and measuring 12 x 8 inches, though the interior measured only 6 x 4 inches. It held three glossy white eggs measuring 29 x 20 mm., 27 x 20 mm. and 27 x 19 mm. respectively. The bird had already started incubating them for there were slight embryos in all three eggs. Later in the day another clutch was brought to me; it also consisted of three eggs, but even less incubated than those in the first clutch. They were, however, slightly larger and measured 30 x 23 mm., 30 x 22 mm. and 29 x 22 mm.

MUSOPHAGIDAE

TURACUS LIVINGSTONII LIVINGSTONII Gray

Turacus livingstonii Gray, 1864, Proc. Zoöl. Soc. London, p. 44: Manganja highlands, Nyasaland.

♂ 3 ♀ (M. C. Z. 148,339-42) Madehani, Ukinga Mtns. 13-20. ii. 30.

4 ♂ 4 ♀ (M. C. Z. 148,343-50) Nkuka Forest, Rungwe Mtn. 31. iii-9. iv. 30.

♂ ♀ (M. C. Z. 148,351-52) Igale, Poroto Mtns. 25-30. iv. 30.

Native names. Nyamakara (Kikinga); *ingulusitu* (Kinyakusa); *chilemba* (Kinyika).

Distribution. These birds are quite typical, though the localities fifty miles northwest and due north of Lake Nyasa show that the typical form ranges somewhat farther north than Sclater in the *Systema Avium Aethiopicarum* would lead us to suppose.

TURACUS LIVINGSTONII CABANISI (Reichenow)

Corythaix cabanisi Reichenow, 1883, Journ. Ornith., p. 221: Bagamoyo, Tanganyika Territory.

5 ♂ 6 ♀ (M. C. Z. 148,353-63) Kigogo, Uzungwe Mtns. 13-28. i. 30.

Variation. Our series of the Tanganyika Lourie from Kigogo tends to be somewhat intermediate and is definitely not such a deep blue-green as examples from the Uluguru Mountains, as one might expect on geographical grounds. They are, however, quite definitely nearer to *cabanisi* than to the typical form.

Habitat. The Tanganyika Lourie was sought for in its type locality but was not found; unless its occurrence is seasonal, it is apparently a scarce bird at Bagamoyo, perhaps only a straggler from the not far

distant Nguru Mountains. At Kigogo, where they were very numerous, they frequented the scattered groups of trees and bush which are found in the grasslands of the Mufindi region. These small patches of bush would appear to be partially fire-resistant thickets surviving from the adjacent rain forests.

GALLIREX PORPHYREOLOPHUS CHLOROCHALMYS Shelley

Gallirex chlorochalmys Shelley, 1881, Ibis, p. 118: Ugogo, Tanganyika Territory.

♂ ♀ ♀ (M. C. Z. 148,364-6) Bagamoyo. 14. xi. 29.

♂ ♀ (M. C. Z. 148,367-8) Saranda, Ugogo. 30. xi. 29.

Habitat. The East African Purple-crested Lourie inhabits open bush in hot dry country and occurs but rarely at altitudes over 3,000 feet as far as the junior author's experience goes.

MUSOPHAGA ROSSAE Gould

Musophaga rossae Gould, 1851, Proc. Zool. Soc. London, p. 93: said to have come from the western coast of Africa, i. e. Loanda, Angola.

♀ (M. C. Z. 148,369) Kitungulu, Urungu. 15. v. 30.

Habitat. Kitungulu, as mentioned elsewhere, possesses a fast-disappearing patch of semi-dry primary forest in which many West African species are to be found.

GYMNOSCHIZORHIS LEOPOLDI (Shelley)

Schizorhis leopoldi Shelley, 1881, Ibis, p. 117, pl. 2: Ugogo, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,370-1) Mangasini, Usandawi. 14. xii. 30.

♀ (M. C. Z. 148,372) Shinyanga, Usukuma. 3. vi. 30.

Native name. Mnemba (Kikerewe).

Variation. We accept Dr. Friedmann's conclusions that *G. l. centralis* Neumann cannot be recognised. It was described from Kitungule, Kagera River, Uganda.

PSITTACIDAE

PSITTACUS ERITHACUS ERITHACUS Linnaeus

Psittacus erithacus Linnaeus, 1758, Syst. Nat., 10th ed., p. 99. Guinea.

Distribution. A flock of Grey Parrots was seen by the junior author in the remnant of primary forest at Kitungulu, which is some twelve miles east of Kasanga on the eastern shores of Lake Tanganyika.

Mr. Wolff of the Uzungwe Mountains tells me that in a rare little book (in German) by Dr. Fischer, it is stated that the Grey Parrot occurs on Kilimanjaro. He would not credit the statement at the time, but when the East African campaign took him to the Kilimanjaro forests he kept a special look out for these birds and was rewarded, so he says, by seeing a flock one morning shortly after daybreak.

POICEPHALUS FUSCICAPILLUS TANGANYIKAE Bowen

Poicephalus fuscicapillus tanganyikae Bowen, 1930, Proc. Acad. Nat. Sci., Philad., 82, p. 267: Kilosa, Tanganyika Territory.

♂ (M. C. Z. 148,375) Bagamoyo. 14. xi. 29.

Distribution. Bagamoyo being exactly opposite, and only forty miles distant from, Zanzibar which is the type locality of *P. f. fuscicapillus*, it is interesting to record that the wing measurements are 148 mm., the minimum length recorded by Bowen.

Breeding. The testes were enlarged so that the bird probably breeds at the coast during the lesser rains.

POICEPHALUS MEYERI SATURATUS (Sharpe)

Poicephalus saturatus Sharpe, 1901, Bull. Brit. Orn. Club, xi, p. 67: North Ankole, Uganda.

♂ (M. C. Z. 148,373) Kitungulu, Urungu. 15. v. 30.

♀ (M. C. Z. 148,374) Ukerewe Id., Lake Victoria. 12. vi. 30.

Native name. *Nswenja* (Kikerewe).

Affinities. On geographical grounds one might expect the Kitungulu birds to represent the Congo race *nearci*, but a careful comparison of the two specimens listed above shows no variation in the direction of *nearci*.

Breeding. The testes were small in the Kitungulu example of the Uganda Brown Parrot.

AGAPORNIS FISCHERI Reichenow

Agapornis fischeri Reichenow, 1887, Journ. Ornith., p. 54: Ussure, Tanganyika Territory.

♂♂ (M. C. Z. 148,376-7) Shinyanga, Usukuma. 2. vi. 30.

Habitat. Fischer's Love Bird favours the baobab trees which are scattered about the open country and through the thorn bush of the Usukuma country. It was from the bare branches of baobabs that these noisy little parrots were shot.

CORACIIDAE

*CORACIAS GARRULUS GARRULUS Linnaeus

Coracias garrulus Linnaeus, 1758, Syst. Nat., 10th ed., p. 107: Europe; restricted type locality, southern Sweden.

♂ (M. C. Z. 148,378) Ilolo, Rungwe. 3. iv. 30.

Native name. *Imbusanya* (generic, of course, Kinyakusa).

A number of European Rollers, evidently migrant birds proceeding north, appeared on the day on which this bird was shot but were not seen again.

CORACIAS SPATULATUS SPATULATUS Trimen

Coracias spatulatus Trimen, 1880, Proc. Zool. Soc. London, p. 31: Leshumo valley, near Victoria Falls; Kothe, 1911, Mitt. Zool. Mus. Berlin, p. 354: Kitungulu, etc.

♀ (M. C. Z. 148,379) Kitungulu, Urungu. 15. v. 30.

Affinities. We cannot agree with Sclater that *weigalii* is the young of *spatulatus*.

Habitat. Small parties of these noisy birds were occasionally seen in the open dry bush, an environment exactly comparable to the miombo bush at Kipera, where the junior author collected this species on February 22, 1923! On the label of the Kitungulu bird he noted "Call like that of the monkey-chatterer—*Irrisor*." An observation corroborating that made by Fromm, as cited by Kothe, in the reference given above.

CORACIAS CAUDATUS CAUDATUS Linnaeus

Coracias caudatus Linnaeus, 1766, Syst. Nat., 12th ed., 1, p. 160: Angola.

♂ (M. C. Z. 148,380) Shinyanga, Usukuma. 2. vi. 30.

Native name. *Nawagara* (Kikerewe).

EURYSTOMUS AFER SUAHELICUS Neumann

Eurystomus afer suahelicus Neumann, 1905, Journ. f. Orn., p. 186: Tschara, Tana River, Kenya Colony.

♂ (M. C. Z. 148,381) Bagamoyo. 12. xi. 29.

ALCEDINIDAE

CERYLE RUDIS RUDIS (Linnaeus)

Alcedo rudis Linnaeus, 1758, Syst. Nat., 10th ed., p. 116: Egypt.

♀ (M. C. Z. 148,382) Kipili, Lake Tanganyika. 19. v. 30.

♀ (M. C. Z. 148,383) Mwanza, Lake Victoria. 9. vi. 30.

Native names. *Mrovi* (Kikerewe); *mwituzu* (Kisukuma).

Breeding. On June 9, 1930, just before sailing from Mwanza for Ukerewe Island, my attention was attracted by the behavior of one of these birds which was sitting with a fish in its bill in a rubber tree some two hundred yards from the lake shore opposite the landing stage for Ukerewe boats. Near by where the bird was sitting was a disused quarry and on examining this I found a number of kingfisher nesting holes, mostly old. In the entrance of one, however, was a stone and on removing this I found a dead hen Pied Kingfisher covered with ants but so recently dead as to be easily preserved. The stone had almost certainly been placed in the entrance by some rascally native youngster, and it is on account of their heartless and destructive ways of collecting birds that I almost invariably refuse to purchase birds from them. As the great majority of birds brought in are mother birds or nestlings, purchasing from natives involves much cruelty, and the wholesale destruction of bird life in the vicinity of a camp.

On opening up the hole, it was found to extend five feet into the bank, at first with a slightly rising gradient and then slightly descending until it widened into the terminal nest chamber. In this chamber were four white eggs, measuring 29 x 22 mm., lying on the earth floor on which were scattered sparsely some fish scales. In the same quarry a second nest was examined; the hole in this case was rather higher up the bank—about seven feet instead of five, but the tunnel only penetrated inwards for a distance of four feet; in both cases the entrances were about two feet below the top of the bank. The second nest was similar to the first and also held four eggs, but they varied in size from 30 x 21 to 28 x 21 mm. Both clutches were hard set and held well-developed young.

On June 11, 1930, at Ukerewe Island, a native brought a Pied Kingfisher to camp. I accused him of having trapped it in its burrow which he readily admitted.

On June 28, 1930, when at Entebbe, Uganda, a native brought in one of these birds together with its four eggs, the latter were very near hatching and were not purchased.

CORYTHORNIS CRISTATA CRISTATA (Pallas)

Alcedo cristata Pallas, 1764, in Vroeg. Cat. Adumb., no. 55, pl. i: Cape of Good Hope, South Africa.

♀ (M. C. Z. 148,384) Bagamoyo. 11. xi. 29.

♂ (M. C. Z. 148,385) Mwaya, Lake Nyasa. 6. iii. 30.

♂ (M. C. Z. 148,386) Ujiji, Lake Tanganyika. 24. v. 30.

Breeding. The bill of the Ujiji Malachite Kingfisher is black, a sign of juvenility.

ISPIDINA PICTA NATALENSIS (Smith)

Alcedo natalensis Smith, 1831, S. Afr. Quart. Journ., 1st ser., no. 5, p. 14: east of Cafferland, i. e. Natal.

♂ ♀ (M. C. Z. 148,387-8) Ukerewe Id., Lake Victoria. 19. vi. 30.

Breeding. Both are barely fledged nestlings brought by a native who procured them from their nesthole. They were accepted as we were about to depart from the island, and to save them from a worse fate. Being juvenile, we assume the race on geographical grounds.

HALCYON SENEGALENSIS SENEGALENSIS (Linnaeus)

Alcedo senegalensis Linnaeus, 1766, Syst. Nat., 12th ed., 1, p. 180: Senegal.

♀ (M. C. Z. 148,389) Shinyanga, Usukuma. 3. vi. 30.

Affinities. This Red-and-black-billed Kingfisher is undoubtedly *senegalensis* or the race *cinereicapillus*, if the latter be recognisable, but it is certainly not *cyanoleucos*.

HALCYON SENEGALOIDES RANIVORA Meinertzhagen

Halcyon senegaloides ranivora Meinertzhagen, 1924, Bull. Brit. Orn. Club, 44, p. 44: Pangani River, Tanganyika Territory.

3 eggs (M. C. Z. 7,599) near Mombasa Id., Kenya Colony. 29. x. 29.

Breeding. While visiting the mainland opposite Mombasa Island, on October 29, 1929, I observed fresh tracks outside a burrow in one of the pits which are excavated by the natives to get material for the mud walls of their huts; the pit was certainly within fifty feet of the house. As we were digging out the burrow and were just approaching the end, which was only three feet from the entrance, a bird burst forth and flew with loud cries to a near-by mango tree, so that one

had a good opportunity of observing its red bill, whitish, though slightly dusky throat and breast and black wings edged with pale blue. These were noted down on the spot, and I think that the identification is correct beyond question. The bird was evidently sitting on the three eggs, one of which was slightly incubated, the other two apparently addled. These eggs were laid on the bare sand, there being no beetle wings or other debris; they were white, sparsely freckled with pale brown and measured 25 x 24 mm.

HALCYON LEUCOCEPHALA LEUCOCEPHALA (Müller)

Alcedo leucocephala P. L. S. Müller, 1776, Syst. Nat., Suppl., p. 94: Senegal.

3 ♀ (M. C. Z. 148,390-2) Mwanza, Lake Victoria. 6. vi. 30.

Native name. Kaseko (Kikerewe).

Breeding. At Mwanza on June 9, 1930, two Brown-bellied or Grey-headed Kingfishers were observed pecking out nesting holes in a high cliff. When camped on Ukerewe Island (June 10 to 19) as well as on my return to Mwanza (June 21) natives brought several of these birds (which I refused to purchase) that had evidently been captured in their nesting holes.

HALCYON CHELICUTI VARIEGATA (Vieillot)

Alcedo variegata Vieillot, 1820, Ency. Method., 1, p. 397: Senegal.

Halcyon chelicuti zinjense Stoneham, 1930, Bateleur, 2, p. 51: Dar es Salaam, Tanganyika Territory.

2 eggs (M. C. Z. 7,598) near Mombasa, Kenya Colony. 29. x. 29.

Breeding. When on the mainland just opposite Kilindini harbour on October 29, 1929, a native lad, who was following me as I passed beneath a mango tree, descried an East African Coastal Striped Kingfisher fly from a hole in the end of a broken-off branch which was about twelve feet from the ground. He climbed to the limb and looking in espied two fresh eggs lying on the bare disintegrated wood which was more like rich loam than wood. It is probable that a full clutch would consist of three eggs; the two in this instance were pure white and measured 20 x 17 mm. and 19 x 17 mm. respectively. We follow Mr. W. Wedgewood Bowen in using *variegata* for the East African coastal form of this bird.

MEROPIDAE

*MEROPS APIASTER Linnaeus

Merops apiaster Linnaeus, 1758, Syst. Nat., 10th ed., p. 117: southern Europe.

♂ (M. C. Z. 148,393) Unyanganyi, Turu. 4. xii. 29.

*MEROPS PERSICUS PERSICUS Pallas

Merops persicus Pallas, 1773, Reise, 2, p. 708: shores of the Caspian Sea.

♂ ♀ (M. C. Z. 148,394-5) Bagamoyo. 14. xi. 29.

AEROPS ALBICOLLIS MAJOR Parrot

Aerops albicollis major Parrot, 1912, Orn. Monatsb., 18, p. 12: Bagamoyo, Tanganyika Territory.

♀ (M. C. Z. 148,396) Bagamoyo. 12. xi. 29.

MELITTOPHAGUS PUSILLUS MERIDIONALIS Sharpe

Melittophagus meridionalis Sharpe, 1892, Cat. Birds Brit. Mus., 17, p. 45, pl. i, fig. 4: Pinetown, Natal.

Breeding. At Unyanganyi, on December 4, 1928, I was shown a female together with two newly hatched young.

MELITTOPHAGUS BULLOCKOIDES (Smith)

Merops bullockoides Smith, 1834, S. A. Quart. Journ., 2d ser., p. 320: South Africa.

♀ (M. C. Z. 184,397) Bagamoyo. 14. xi. 29.

BUCEROTIDAE

BYCANISTES BUCINATOR (Temminck)

Buceros bucinator Temminck, 1824, Pl. Col. livr. 48, pl. 284: Cape of Good Hope, South Africa.

♂ ♂ ♀ (M. C. Z. 148,398-400) near Mwaya, Lake Nyasa. 1. iii. 30.

Habitat. These Trumpeter Hornbills were shot in some large trees in the middle of a village through which we passed on the way to Mwaya, their raucous cries were mingled with those of the Silvery-cheeked Hornbill, with which they were associating here as at Mt. Lutindi in the Usambara range.

BYCANISTES CRISTATUS BREVIS Friedmann

Bycanistes cristatus brevis Friedmann, 1929, Proc. N. Eng. Zoöl. Club, **11**, pp. 32-33: Mt. Lutindi, Usambara Mtns., Tanganyika Territory.

♂ (M. C. Z. 148,401) Kigogo, Uzungwe Mtns. 28. i. 30.

♂ ♀ (M. C. Z. 148,402-3) Madehani, Ukinga Mtns. 25. ii. 30.

♀ (M. C. Z. 148,404) Mwaya, Lake Nyasa. 1. iii. 30.

5 ♂ 3 ♀ (M. C. Z. 148,405-12) Nkuka Forest, Rungwe Mtn. 25. iii-14. iv. 30.

Native names. *Minongo* (Kikinga); *kasanga* (Kinyakusa); *ngonga* (Kinyika).

Affinities. This series was collected with the specific view to checking the validity of Friedmann's recently described southern race of the Silvery-cheeked Hornbill. We find that it certainly upholds his contention that southern birds are smaller than Ethiopian ones. Thus, in the above series, we find that the wing measurements of the males range from 342-360 mm., with an average of 350 mm.; while those of the females range from 330-340 mm., with an average of 337.5 mm.

LOPHOCEROS NASUTUS EPIRHINUS (Sundevall)

Buceros epirhinus Sundevall, 1851, Oefv. Vet.-Akad. Forh. for 1850, p. 108: Caffraria sup. ad. lat. 24° S., i. e. probably upper Limpopo Valley.

♂ ♀ ♀ (M. C. Z. 148,413-5) Ukerewe Id., Lake Victoria. 11. vi. 30.

Native name. *Kantera* (Kikerewe).

LOPHOCEROS ERYTHORHYNCHUS ERYTHORHYNCHUS (Temminck)

Buceros erythrorhynchus Temminck, 1823, Pl. Col. livr. 36, sp. 19: Senegal.

♂ ♀ (M. C. Z. 148,416-7) Kilamatinde, Ugogo. 27. xi. 29.

LOPHOCEROS MELANOLEUCOS MELANOLEUCOS (Lichtenstein)

Buceros melanoleucos Lichtenstein, 1793, Cat. Rer. Rar. Nat., p. 8: Kaffirland.

♂ ♂ ♀ ♀ (M. C. Z. 148,418-21) Madehani, Ukinga Mtns. 14. ii. 30.

♀ (M. C. Z. 148,422) Nkuka Forest, Rungwe Mtn. 25. iii. 30.

♀ ♀ (M. C. Z. 148,423-4) Igale, Poroto Mtns. 30. iv. 30.

Native names. *Kasweswe* (Kikinga, Kinyakusa and Kinyika).

Affinities. According to Friedmann (1930, U. S. Nat. Mus. Bull., 153, p. 427), these birds should be *L. m. stegmanni* judged by the distribution of the races. On measuring the wings of the five females,

however, we find the wing ranges from 220–237 mm., with an average of 227 mm., and they should, therefore, be referred to the typical form. The wings of the males measure 225–250 mm., the wing of the smaller being less than given for any of the races. This series presents so much variation in regard to sheen, darker or paler plumage, or duskie tips to the bills, that we are utterly at a loss to find sufficient grounds to uphold the races *suahelicus* and *stegmanni*, and are inclined to agree with Selater's opinion and that of Friedmann in an earlier paper (1928, *Ibis*, p. 81) and drop both.

PHOENICULIDAE

RHINOPOMASTUS MINOR EXTIMUS Friedmann

Rhinopomastus minor extimus Friedmann, 1929, Proc. N. Eng. Zoöl. Club., 11, p. 29: Dodoma, Ugogo, Tanganyika Territory.

♂ (M. C. Z. 148,425) Mangasini, Usandawi. 16. xii. 29.

Affinities. The wing measurement of this male is 109 mm., thus supporting Friedmann's conclusions. Mangasini is sixty miles (as the Scimitar-bill flies) northwest of Dodoma, the type locality of this race.

TYTONIDAE

TYTO ALBA AFFINIS (Blyth)

Strix affinis Blyth, 1862, *Ibis*, p. 388: Cape of Good Hope, South Africa.

♀ (M. C. Z. 148,426) Tukuyu, Rungwe. 21. iv. 30.

♀ (M. C. Z. 148,427) Ujiji, Lake Tanganyika. 23. v. 30.

Native name. *Ngwiitwa* (Kinyakusa).

STRIGIDAE

OTUS LEUCOTIS GRANTI (Kollibay)

Pisorhina leucotis granti Kollibay, 1910, Orn. Monatsb., 18, p. 148: southwestern Africa.

♂ (M. C. Z. 148,428) Ujiji, Lake Tanganyika. 26. v. 30.

Breeding. This bird is a juvenile but almost fledged, and was brought to me by a native youngster who said that he had found three in a hollow tree.

Distribution. Slater gives the range of *granti* as: "South Africa, north to Angola and Nyasaland," so that this record extends the range considerably to the north and is confirmed by several other skins from central Tanganyika Territory taken in past years by the junior author. The typical form extends from Senegambia and the Nile south to Kenya Colony.

BUBO AFRICANUS AFRICANUS (Temminck)

Strix africana Temminck, 1823, Pl. Col. livr. 9, pl. 50: Cape of Good Hope, South Africa.

♀ (M. C. Z. 148,429) Saranda, Ugogo. 28. xi. 29.

♀ (M. C. Z. 148,430) Mwanza, Lake Victoria. 6. vi. 30.

Breeding. At Saranda, on the evening of November 28, 1929, I observed an owl leaving a baobab tree as I approached. It alighted in an acacia, where it was being mobbed by a flock of starlings (*Spreo bicolor*) when I shot it. On returning to the baobab, I discovered a hole which had previously escaped my notice. In it was a single nestling Spotted Eagle-Owl that was almost fully fledged. I took it and kept it for a week until I could leave it in the care of the lady missionaries at Kilimatinde who were going to release it when able to fly and take care of itself.

Parasites. Lice were found on the Saranda bird.

CAPRIMULGIDAE

*CAPRIMULGUS EUROPÆUS UNWINI Hume

Caprimulgus unwini Hume, 1871, Ibis, p. 406: Agrore valley, Hazara district, northwestern India.

♀ (M. C. Z. 148,431) Kigogo, Uzungwe Mtns. 27. i. 30.

CAPRIMULGUS FOSSI CLARUS Reichenow

Caprimulgus clarus Reichenow, 1892, Journ. f. Orn., p. 29: Bukoba, Victoria Nyanza, Tanganyika Territory.

♂ (M. C. Z. 148,432) Bagamoyo. 12. xi. 29.

♀ (M. C. Z. 148,433) Kasanga, Lake Tanganyika. 17. v. 30.

♀ (M. C. Z. 148,434) Ukerewe Id., Lake Victoria. 11. vi. 30.

Measurements. The wings of these three birds measure ♂ 146 mm., ♀ 150 mm. and the Ukerewe Island ♀ 147 mm.

Breeding. The Bagamoyo male was shot from the "nest" on which it was brooding two eggs of the usual mottled rufus color and measuring 25 x 18 mm.

COLIIDAE

COLIUS STRIATUS BERLEPSCHI Hartert

Colius leucotis berlepschi Hartert, 1899, in Ansorge's "Under the African Sun," App. Bds., p. 333: Neu-Helgoland, Songea district, Tanganyika Territory.

♀ (M. C. Z. 148,435) Iloilo, Rungwe. 26. iii. 30.

Native name. *Isyakuku* (Kinyakusa and Kinyika).

COLIUS STRIATUS KIKUYUENSIS van Someren

Colius striatus kikuyuensis van Someren, 1919, Bull. Brit. Orn. Club, 40, p. 26: Chagwe, Uganda.

♂ ♂ ♀ (M. C. Z. 148,436-8) Mwanza, Lake Victoria. 9. vi. 30.

Native name. *Musilia* (Kikerewe).

Affinities. We follow Friedmann in recognising this race which Selater regarded as a synonym of *ugandensis*.

TROGONIDAE

HETEROTROGON VITTATUM VITTATUM (Shelley)

Hapaloderma vittatum Shelley, 1882, Proc. Zoöl. Soc. London, p. 306: Mamboio; i. e. Mamboya, Ugogo, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,439-30) Madehani, Ukinga Mtns. 24-26. ii. 30.

♂ ♂ ♀ ♀ (M. C. Z. 148,441-44) Nkuka Forest, Rungwe Mtn. 28. iii-10. iv. 30.

Native names. *Mbuyakitzi* (Kikinga); *mwakalindile* (Kinyakusa); *mwanjali* (Kinyika).

Curiously enough the Narina Trogon was not seen during any part of the eight month's *safari*.

CAPITONIDAE

LYBIUS LEVAILLANTI MACCLOUNII (Shelley)

Melanobucco macclounii Shelley, 1899, Bull. Brit. Orn. Club, 8, p. xxxv: Luchinde, north of Lake Nyasa.

Lybius macclounii Kothe, 1911, Mitt. Zoöl. Mus. Berlin, p. 352: Kitungulu, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,445-6) Kitungulu, Urungu. 14. v. 30.

TRICHOLAEMA LACRYMOSUM RADCLIFFEI Grant

Tricholaema radcliffei Ogilvie-Grant, 1904, Bull. Brit. Orn. Club, **15**, p. 29: Mulema, Uganda.

♀ (M. C. Z. 148,447) Bukoba, Lake Victoria. 24. vi. 30.

BUCCONODON OLIVACEUM OLIVACEUM (Shelley)

Barbatula olivacea Shelley, 1880, Ibis, p. 334, pl. vii: Rabai, near Mombasa, Kenya Colony.

♂ ♀ (M. C. Z. 148,448-9) Nkuka Forest, Rungwe Mtn. 28. iii-14. iv. 30.

♀ (M. C. Z. 148,450) Igale, Poroto Mtns. 29. iv. 30.

Native name. *Indalulambwa* (Kinyakusa and Kinyika).

VIRIDIBUCCO SIMPLEX LEUCOMYSTAX (Sharpe)

Barbatula leucomystax Sharpe, 1892, Ibis, p. 310: Sotik, Kenya Colony.

♂ (M. C. Z. 148,451) Kigogo, Uzungwe Mtns. 20. i. 30.

♂ (M. C. Z. 148,452) Madehani, Ukinga Mtns. 14. ii. 30.

♂ ♂ ♀ ♀ (M. C. Z. 148,453-6) Tukuyu, Rungwe. 22-23. iv. 30.

Native name. *Givirire* (Kikinga).

POGONIULUS LEUCOLAIMA NYANSAE (Neumann)

Barbatula leucolaima nyanse Neumann, 1907, Journ. f. Orn., p. 347: Bukoba, Victoria Nyanza, Tanganyika Territory.

Breeding. I shot a cock Lemon-rumped Tinker Bird on the branch of a tree at Bukoba, the type locality of the form, on June 24, 1930. Unfortunately the skin was lost among the packing. A moment after the cock was shot, a hen (?) bird appeared, flew straight to the broken limb above, on which the cock had been perched, and dived into a freshly-pecked-out hole, though her tail never disappeared from sight. Salimu climbed to the place but found on examination that the hole was comparatively shallow and only in process of excavation.

POGONIULUS BILINEATUS FISCHERI (Reichenow)

Barbatula fischeri Reichenow, 1880, Orn. Centralb., p. 181: no locality; Zanzibar (*vide* Journ. Ornith., 1885, p. 125).

6 (M. C. Z. 148,457-62) Mwera, Zanzibar. 21-24. x. 30.

As Dr. Friedmann had requested me to procure a topotypic series of this bird, I wrote from Mombasa (where our boat was likely to be

delayed for several days) to Dr. Spurrier who promptly sent out a native collector and had the skins made up and ready for me by the time we reached Zanzibar; unfortunately the native collector did not sex the skins.

Affinities. We have measured the wings of these six birds and find that they range from 50–52 mm. They certainly differ from *P. b. conciliator* which was recently described from the Uluguru Mountains by Friedmann; he is not correct, however, in assuming that *P. b. fischeri* has a slightly more yellowish superciliary stripe; this is only true of young birds. It is pure white in the five topotypic adults.

TRACHYPHONUS EMINI Reichenow

Trachyphonus emini Reichenow, 1891, Journ. f. Orn., pp. 149 & 209: Mpwapwa, Tanganyika Territory.

♀ (M. C. Z. 148,463) Unyanganyai, Turu. 4. xii. 29.

INDICATORIDAE

INDICATOR INDICATOR (Sparrman)

Cuculus indicator Sparrman, 1777, Phil. Trans., 67, p. 43, pl. i: Great Fish River, near Somerset East, Cape Province, South Africa.

♂ (M. C. Z. 148,464) Ukerewe Id., Lake Victoria. 11. vi. 30.

Native name. *Narusegu* (Kikerewe).

Habitat. Curiously enough very few Black-throated Honey Guides were seen during the *safari*; in fact the junior author only recalls having seen two, and they were observed on the march from Kitungulu to Kasanga. The reason for this scarcity would appear to be that they favour the miombo forest, where bees are often numerous and that they are not to be found in rain forest to the same extent.

PICIDAE

DENDROPICOS LAFRESNAYI HARTLAUBII Malherbe

Dendropicos hartlaubii Malherbe, 1849, Rev. Mag. Zoöl., p. 532: Zanzibar.

♂ (M. C. Z. 148,465) Kigogo, Uzungwe Mtns. 30. i. 30.

♀ (M. C. Z. 148,466) Madehani, Ukinga Mtns. 20. ii. 30.

MESOPICOS GRISEOCEPHALUS RUWENZORI Sharpe

Mesopicos ruwenzori Sharpe, 1902, Bull. Brit. Orn. Club, **13**, p. 8: Ruwenzori, Uganda.

♂ (M. C. Z. 148,467) Dabaga, Uzungwe Mtns. 1. i. 30.

♂ ♀ (M. C. Z. 148,468-9) Kigogo, Uzungwe Mtns. 16. i. 30.

Distribution. Neumann, in reviewing the specimens in the Berlin Museum, lists a bird from Mufindi, which is scarcely six miles from Kigogo, as well as others from the Livingstone range, Tukuyu and Mbeya.

ALAUDIDAE

EREMOPTERIX LEUCOPAREIA (Fischer & Reichenow)

Coraphites leucopareia Fischer & Reichenow, 1884, Journ. f. Orn., p. 55: Klein-Aruscha, Tanganyika Territory.

♂ (M. C. Z. 148,470) Unyanganyi, Turu. 4. xii. 29.

♂ ♂ ♀ ♀ (M. C. Z. 148,471-4) Shinyanga, Usukuma. 2. vi. 30.

Breeding. At Shinyanga on June 2, 1930 a nest was found, clean and fresh, apparently ready to receive eggs.

MOTACILLIDAE

MOTACILLA AGUIMP VIDUA Sundevall

Motacilla vidua Sundevall, 1850, Oefv. Vet.-Ak. Forh., **7**, p. 128: Syene, i. e. Assouan, upper Egypt.

Breeding and folklore. At Ujiji, Lake Tanganyika, I observed an African Pied Wagtail on May 25, 1930, adding grass to a nearly completed nest built into the thatch of a house in one of the side streets. It had placed it immediately above the entrance door and so low down that one could almost have reached it without assistance.

These wagtails are exceptionally tame at Ujiji, the reason being that the natives will not molest them for they believe that misfortune will attend the occupants of a house which is not visited by a wagtail during the first fortnight of its construction. So strong is this conviction, that I was told of a petty chief who had already had the site for a new village cleared and the first hut built, abandoning the project entirely because no Pied Wagtail came to sing upon the thatch after the hut was completed.

A recruiter of labor told me that last year these birds were constantly in and out of his house and that his efforts were attended by great success; the following year they did not visit him and his headman confidently prophesied that poor results might be anticipated. This proved to be the case. Another explanation, though unconnected with the presence or absence of wagtails, might be found in that he recruited so many thousands of laborers during his first year that the supply of available volunteers was depleted.

A pair of Pied Wagtails travelled on the lake steamer—the S.S. *Usoga*—from Mwanza to Bukoba on June 23 and 24, 1930, and I was told by the captain that it was a common occurrence and that they generally disembarked at Bukoba and returned to Mwanza by the next boat. Of course the steamer, whose lights attract millions of neuropterous insects of the mayfly type, furnished them with a rich feast for they might be seen actively running about the decks and in the scuppers capturing prey. Once a pair attempted to build on board but it was thought that rats had destroyed the eggs as nothing came of it.

MOTACILLA CLARA Sharpe

Motacilla clara Sharpe, 1908, Ibis, p. 341; nom. nov. pro

Motacilla longicauda Rüppell (nec Gmelin), 1840, N. Wirbelt. p. 84, pl. 29, fig. 2: Simen, Ethiopia.

♂ (M. C. Z. 148,475) Madehani, Ukinga Mtns. 25. ii. 30.

♀ (M. C. Z. 148,476) Nkuka Forest, Rungwe Mtn. 9. iv. 30.

Distribution. Sclater gives the distribution as from Liberia to Ethiopia, south to Natal and Cape Province, where suitable rocky mountain-streams are to be found.

Habitat. In East Africa the junior author has found the Mountain Wagtail associated with streams in the mountain rain forests of the Usambara and Uluguru, as well as the ranges mentioned above.

*BUDYTES FLAVUS FLAVUS (Linnaeus)

Motacilla flava Linnaeus, 1758, Syst. Nat., 10th ed., p. 185: Europe; southern Sweden, *apud* Hartert.

♂ ♀ (M. C. Z. 148,477-8) Ilolo, Rungwe. 3. iv. 30.

Native name. *Indimangombe* (Kinyakusa).

ANTHUS SORDIDUS NYASSAE Neumann

Anthus nicholsoni nyassae Neumann, 1906, Journ. Orn., p. 233: between Sangesi and Songea, northeast of Lake Nyasa.

3 ♂ 3 ♀ (M. C. Z. 148,479-84) Ilolo, Rungwe. 15. iii-18. iv. 30.

2 ♂ (M. C. Z. 148,485) Ujiji, Lake Tanganyika. 23. v. 30.

Native names. *Imbyabyatila* (Kinyakusa); *sheshali* (Kinyika).

Distribution. Both these widely separated and strangely different localities are within the range allocated to this race by Sclater.

*ANTHUS TRIVIALIS TRIVIALIS (Linnaeus)

Alauda trivialis Linnaeus, 1758, Syst. Nat., 10th ed., p. 166: Sweden.

♀ (M. C. Z. 148,487) Mangoto, Ukinga Mtns. 10. ii. 30.

Native name. *Kihorawulime* (undoubtedly generic in Kikinga).

MACRONYX CROCEUS CROCEUS (Vieillot)

Alauda crocea Vieillot, 1816, N. Diet. d'Hist. Nat., 1, p. 365: Java ! Senegal (Swainson).

♂ (M. C. Z. 148,488) Ujiji, Lake Tanganyika. 23. v. 30.

MACRONYX CROCEUS FÜLLEBORNI Reichenow

Macronyx fülleborni Reichenow, 1900, Orn. Monatsb., 8, p. 39: Nyika Plateau, Nyasaland.

♀ (M. C. Z. 148,489) Dabaga, Uzungwe Mtns. 28. xii. 29.

Breeding. Fülleborn's Long-claw was quite common at Dabaga. The specimen listed above was flushed from its nest under an overhanging tussock in foot-high grass bordering a swamp in a valley bottom. The nest, measuring 90 mm. in outside diameter and 30 mm. in depth (approximately $3\frac{1}{2}$ inches by 1 inch), was very loosely constructed of soft dry grasses and neatly lined with fibres and roots. It held three eggs, whose incubation had just commenced, their ground color is whitish mottled all over with pale purple and brown, the markings being concentrated towards the larger pole and sparse around the lesser; in size they are uniform and measure 25 x 18 mm.

MACRONYX AMELIAE WINTONI Sharpe

Macronyx wintoni Sharpe, 1891, Ibis, p. 444: Kavirondo, Kenya Colony.

♂ ♂ ♀ ♀ (M. C. Z. 148,490-3) near Mwaya, Lake Nyasa. 7-10. iii.30.

Affinities. We follow Selater in referring these birds to *wintoni*, though they are considerably darker than either of the two examples of *wintoni* from Nairobi in the Museum of Comparative Zoölogy; this darkness may be attributed to the fact that they are in worn plumage with the light edges of the feathers abraded away. We have no typical *ameliae* for comparison, but Selater states that southern specimens of *wintoni* are intermediate and gives the range as "Western part of Kenya Colony, south through Tanganyika Territory and Northern Rhodesia to the Zambesi valley and Lake Ngami."

TIMALIIDAE

ILLADOPSIS STICTIGULA PRESSA Bangs & Loveridge

Illadopsis stictigula pressa Bangs & Loveridge, 1931, Proc. New Eng. Zoöl. Club, 12, p. 94: Nkuka Forest, Rungwe Mtn, Tanganyika Territory.

♂ (M. C. Z. 148,494) Kigogo, Uzungwe Mtns. 11. i. 30.

♀ (M. C. Z. 148,495) Madehani, Ukinga Mtns. 15. ii. 30.

♂ 3 ♀ (M. C. Z. 148,496-9) Nkuka Forest, Rungwe Mtn. 29. iii-7. iv. 30.

Habits. This bird, like its ally of the Uluguru Mountains, lives in the underbrush of big forest, where it may be seen hopping about feeding among the dead leaves which carpet the forest floor. The skins were shown to upwards of a hundred natives at Madehani and Ilolo, but none of them knew it by sight nor had a name for it. An Mnyika, who lived in the Rungwe forest, said that it was known as *katwakerikanandi* to members of his tribe.

PSEUDOALCIPPE STIERLINGI (Reichenow)

Turdinus stierlingi Reichenow, 1898, Orn. Montasb., 6, p. 82: Iringa, Tanganyika Territory.

♂ ♂ ♀ ♀ (M. C. Z. 148,500-3) Kigogo, Uzungwe Mtns. 13-24. i. 30.

♀ ♀ (M. C. Z. 148,504-5) Nkuka Forest, Rungwe Mtn. 17. iii-14. iv. 30.

♂ ♂ (M. C. Z. 148,506-7) Tukuyu, Rungwe. 22. iv. 30.

♂ (M. C. Z. 148,508) Igale, Poroto Mtns. 29. iv. 30.

Habitat. The Kigogo birds are from just eighty miles south of Iringa, the type locality. In the Uluguru and Uzungwe Mountains these

Hill-Babblers were found at the edge of the bamboos but at Tukuyu, in the gardens laid out in a ravine with ornamental clumps of bamboo and many rain-forest trees.

PYCNONOTIDAE

PYCNONOTUS TRICOLOR MINOR Heuglin

Pycnonotus nigricans var. *minor* Heuglin, 1869, Orn. Nordost. Afr., 1, p. 398: Bahr el Abiad, i. e. upper White Nile.

♀ (M. C. Z. 148,509) Ukerewe Id., Lake Victoria. 13. vi. 30.

Native name. *Ngulie* (Kikerewe).

Affinities. This specimen is in immature plumage but has been compared with both immature and adult White Nile Brown-capped Geelgats from Kome, Mwanza.

PYCNONOTUS TRICOLOR FAYI Mearns

Pycnonotus layardi fayi Mearns, 1911, Smiths. Misc. Coll. Wash., 56, No. 20, p. 7: Fay's Farm, Njabini, Kenya Colony.

♂ (M. C. Z. 148,510) Kigogo, Uzungwe Mtns. 28. i. 30.

♀ (M. C. Z. 148,511) Tukuyu, Rungwe. 23. iv. 30.

Breeding. At Ujiji on May 28, 1930, a pair of Black-capped Geelgats, presumably of this race, were observed feeding several noisy and demonstrative fledglings.

Distribution. Though the birds listed above were taken far south of the range as given by Sclater, there seems to be no question as to their being *fayi*.

PHYLLASTREPHUS FISCHERI PLACIDUS (Shelley)

Xenocichla placida Shelley, 1889, Proc. Zoöl. Soc. London, p. 363: Kilimanjaro, Tanganyika Territory.

♀ ♀ (M. C. Z. 148,512-3) Kigogo, Uzungwe Mtns. 13-18. i. 30.

♂ ♂ (M. C. Z. 148,514-5) Nkuka Forest, Rungwe Mtn. 7. iv. 30.

♂ (M. C. Z. 148,516) Igale, Poroto Mtns. 30. iv. 30.

Native name. *Inyila* (Kinyika).

ARIZELOCICHLA NIGRICEPS FUSCICEPS (Shelley)

Xenocichla fusiceps Shelley, 1893, Ibis, p. 13: Milanji Plateau, 4,000–5,000 feet, Nyasaland.

6 ♂ 3 ♀ (M. C. Z. 148,517–26) Nkuka Forest, Rungwe Mtn. 24. iii–7. iv. 30.

7 ♂ 7 ♀ (M. C. Z. 148,527–40) Igale, Poroto Mtns. 24–30. iv. 30.

Native names. *Ndwekeri* (generic in Kinyakusa and Kinyika).

ARIZELOCICHLA MILANJENSIS STRIIFACIES (Reichenow & Neumann)

Xenocichla striifacies Reichenow & Neumann, 1895, Orn. Monatsb., 3, p. 74: Marangu, Kilimanjaro, Tanganyika Territory.

3 ♂ (M. C. Z. 148,541–3) Kigogo, Uzungwe Mtns. 15–18. i. 30.

♂ (M. C. Z. 148,544) Tukuyu, Rungwe. 22. iv. 30.

ARIZELOCICHLA MASUKENSIS MASUKENSIS (Shelley)

Andropadus masukensis Shelley, 1897, Ibis, p. 534: Masuku Range, 7,000 feet, northwest of Lake Nyasa, northern Rhodesia.

3 ♂ 2 ♀ (M. C. Z. 148,545–9) Kigogo, Uzungwe Mtns. 13–18. i. 30.

4 ♂ 3 ♀ (M. C. Z. 148,550–6) Madehani, Ukinga Mtns. 17–22. ii. 30.

4 ♂ 11 ♀ (M. C. Z. 148,567–71) Nkuka Forest, Rungwe Mtn. 25. iii–10. iv. 30.

Native names. *Luwiko* (generic in Kikinga); *ndwekeri* (generic in Kinyakusa and Kinyika).

ARIZELOCICHLA CHLORIGULA (Reichenow)

Xenocichla chlorigula Reichenow, 1899, Orn. Monatsb., p. 8: Kalinga, Iringa district, Tanganyika Territory.

5 ♂ (M. C. Z. 148,572–76) Kigogo, Uzungwe Mtns. 13–18. i. 30.

♂ (M. C. Z. 148,577) Madehani, Ukinga Mtns. 14. ii. 30.

Native name. *Luwiko* (generic in Kikinga).

EURILLAS VIRENS VIRENS (Cassin)

Andropadus virens Cassin, 1857, Proc. Phila. Acad. Nat. Sci., p. 34: Cape Lopez, Gaboon.

♂ (M. C. Z. 148,578) Bagamoyo. 14. xi. 29.

♂ (M. C. Z. 148,579) Tukuyu, Rungwe. 23. iv. 30.

MUSCICAPIDAE

ALSEONAX AQUATICUS RUANDAE Gyldenstolpe

Alseonax infulatus ruandae Gyldenstolpe, 1922, Bull. Brit. Orn. Club, **43**, p. 36: Bufundi, Kigezi district, Uganda.

♂ (M. C. Z. 148,580) Ujiji, Lake Tanganyika. 26. v. 30.

Compared with a specimen from Bunyoni, Uganda in the Museum of Comparative Zoölogy.

ALSEONAX ADUSTUS FÜLLEBORNI Reichenow

Alseonax adustus fülleborni Reichenow, 1900, Orn. Monatsb., p. 122: Rupira, Tanganyika Territory.

♂ ♂ ♀ (M. C. Z. 148,581-3) Kigogo, Uzungwe Mtns. 20-28. i. 30.

♂ ♀ (M. C. Z. 148,584-5) Madehani, Ukinga Mtns. 17-18. ii. 30.

♀ (M. C. Z. 148,586) Ilolo, Rungwe. 3. iv. 30.

Affinities. The pair from Madehani, as well as a pair of the Kigogo birds, are juveniles in speckle-breasted plumage. This race is not recognized by Sclater but neither does he allow for the occurrence of any race of *adustus* in this region. The adults have been compared with birds from the Uluguru Mountains.

ALSEONAX MINIMUS PUMILUS Reichenow

Alseonax pumila Reichenow, 1892, Journ. f. Orn., pp. 32, 218: Bukoba, Victoria Nyanza, Tanganyika Territory.

♀ (M. C. Z. 148,587) Bukoba, Lake Victoria. 24. vi. 30.

We take this opportunity of drawing attention to the misprints on pages 398 and 399 of Sclater's *Systema Avium Aethiopicarum*, where races of *minimus* appear as races of *murinus* in two instances, evidently a typographical error as shown from the context.

PARISOMA PLUMBEUM ORIENTALE Reichenow & Neumann

Parisoma orientale Reichenow & Neumann, 1895, Orn. Monatsb., **3**, p. 74: Kibwezi, Kenya Colony.

♂ ♀ (M. C. Z. 148,588-9) Bagamoyo. 14. xi. 29.

Breeding. Of these Eastern Grey Tit-babblers, the male had enlarged testes, while the ovaries of the female held well-developed ova indicating that the bird breeds in the lesser rains at the coast.

BRADORNIS MICRORHYNCHUS MICRORHYNCHUS Reichenow

Bradornis microrhynchus Reichenow, 1887, Journ. f. Orn., p. 62: Irangi, Tanganyika Territory.

Bradornis griseus griseus Reichenow *auct.*

♂ (M. C. Z. 148,590) Shinyanga, Usukuma. 3. vi. 30.

Grote has recently shown in the Orn. Monatsb. that *microrhynchus* must be substituted for *griseus* as the name of this common Grey Flycatcher.

DIOPTROORNIS NYIKENSIS (Shelley)

Muscicapa nyikensis Shelley, 1899, Bull. Brit. Orn. Club, 8, p. 35: Nyika Plateau, Nyasaland.

♀ (M. C. Z. 148,591) Dabaga, Uzungwe Mtns. 28. xii. 29.

♀ (M. C. Z. 148,592) Iloilo, Rungwe. 3. iv. 30.

♂ ♀ ♀ (M. C. Z. 148,593-5) Igale, Poroto Mtns. 28. iv. 30.

Distribution. The Iloilo Nyasa Slaty Flycatcher is practically a topotype, and the others come from localities within the range of the race as defined by Sclater.

EMPIDORNIS SEMIPARTITUS KAVIRONDENSIS (Neumann)

Bradyornis kavirondensis Neumann, 1900, Journ. f. Orn., p. 257: Kwa Kissero, Kavirondo, Uganda.

♀ (M. C. Z. 148,596) Shinyanga, Usukuma. 3. vi. 30.

CHLOROPETA NATALENSIS MASSAICA Fischer & Reichenow

Chloropeta massaica Fischer & Reichenow, 1884, Journ. f. Orn., p. 54: Tschaga, base of Kilimanjaro, Tanganyika Territory.

♂ 3 ♀ (M. C. Z. 148,597-600) Kigogo, Uzungwe Mtns. 28-30. i. 30.

♀ (M. C. Z. 148,601) Bulongwa, Ukinga Mtns. 12. ii. 30.

Native name. *Sokosela* (Kikinga).

Affinities. As these birds agreed with the description of Richmond's *C. n. similis* from Kilimanjaro in being smaller than *natalensis*, and as there are no specimens of *similis* in the Museum of Comparative Zoölogy, we submitted the series to Dr. H. Friedmann for comparison with the type of *similis*, which is in the National collection. Dr. Friedmann replies that he considers our birds to be *massaica*.

Measurements. Two of the Kigogo birds are immature. The wing-length of the adult male is 62 mm. and that of both females 60 mm., while those of the immature birds are 57 and 58 mm. respectively. Richmond's type of *similis* was not quite adult, with a wing of 55 mm.

BATIS MIXTA (Shelley)

Pachyprora mixta Shelley, 1889, Proc. Zool. Soc. London., p. 359, pl. xl:
Kilimanjaro, 6,000-7,000 feet, Tanganyika Territory.

5 ♂ 2 ♀ (M. C. Z. 148,602-8) Kigogo, Uzungwe Mtns. 13-24. i. 30.

♂ ♂ ♀ (M. C. Z. 148,609-11) Madehani, Ukinga Mtns. 15-19. ii. 30.

♂ ♂ 3 ♀ (M. C. Z. 148,612-6) Nkuka Forest, Rungwe Mtn. 25. iii-8. iv. 30.

♂ ♂ ♀ (M. C. Z. 148,617-9) Igale, Poroto Mtns. 24-30. iv. 30.

Native names. Kimbasasa (Kikinga); horora (Kinyika).

PLATYSTIRA PELTATA PELTATA Sundevall

Platystira peltata Sundevall, 1850, Oefv. Vet.-Akad. Forh. Stockholm, 7, p. 105:
Caffraria inferiore; i. e. Umlezi River, near Durban, Natal.

♂ ♀ (M. C. Z. 148,620-1) Igale, Poroto Mtns. 29. iv. 30.

ERRANORNIS LONGICAUDA TERESITA (Antinori)

Elminia teresita Antinori, 1864, Cat. Descr. Ucc., p. 50: Djur, Bahr el Ghazal, Sudan.

♂ ♀ ♀ (M. C. Z. 148,622-4) Bukoba, Lake Victoria. 24. vi. 30.

Breeding. Two nests of the Bahr el Ghazal Blue Flycatcher were found at Bukoba on June 24, 1930. One was situated on the horizontal branch of a coffee tree and the bird was sitting; a more dainty sight could hardly be imagined than was presented by this brilliant little blue bird on its nest of grey lichen and cobwebs with a background of red coffee berries and rich green leaves. The nest was about four feet from the ground. Externally it measures 40 mm. in height and 60 mm. across, it is covered with grey lichen held in place by cobwebs, a single feather is woven into the structure; internally it measures 43 mm. across and 23 mm. in depth and is lined with fine hair-like fibres and a downy feather or two. The two eggs have a white ground color with a tonsure-like band of olive, slightly flecked with purple, round the larger pole, though a considerable distance from it. They measured 15 x 13 mm. and the shells were so thin, as they had been incubated to the point of hatching, that they were unblowable. Both parent birds were collected.

The second nest was placed in the fork of a very young coffee tree; it held two recently hatched young, quite freshly dead and swarming with large black ants that were engaged in eating them piecemeal.

ERRANORNIS ALBICAUDA (Bocage)

Elminia albicauda Bocage, 1877, Journ. Sci. Lisboa, 6, p. 159: Caconda, Angola.

♂ (M. C. Z. 148,625) Iloilo, Rungwe. 8. iv. 30.

♂ ♀ (M. C. Z. 148,626-7) Tukuyu, Rungwe. 21-22. iv. 30.

Affinities. If it were possible to recognise Grote's *E. a. kiruensis* then these skins should belong to that race but it does not appear to us that the Kivu birds can be differentiated.

TROCHOCERCUS ALBONOTATUS SUBCAERULEUS Grote

Trochocercus albonotatus subcaeruleus Grote, 1923, Orn. Monatsb., 31, p. 19: Mlalo, Usambara Mtns., Tanganyika Territory; Friedmann, 1928, Ibis, p. 85: Uluguru and Usambara localities.

♂ ♂ ♀ (M. C. Z. 148,628-30) Kigogo, Uzungwe Mtns. 13-15. i. 30.

4 ♂ (M. C. Z. 148,631-4) Nkuka Forest, Rungwe Mtn. 7-8. iv. 30.

♀ (M. C. Z. 148,635) Igale, Poroto Mtns. 25. iv. 30.

Native name. *Nelca* (Kinyika).

Affinities. Slater considers this form indistinguishable from *albonotatus* which was described from Mt. Elgon. Like Friedmann, we have no typical *albonotatus* for comparison and only tentatively refer them to Grote's race as we find them identical with the series of twelve skins reported on by Friedmann in 1928.

TCHITREA VIRIDIS SUAHELICA (Reichenow)

Terpsiphone perspicillata suahelica Reichenow, 1898, in Werther, Mittl. Hochl. D. Ostaf., p. 275: Kibosho, Kilimanjaro, Tanganyika Territory.

♂ (M. C. Z. 148,636) Dodoma, Ugogo. 23. xii. 29.

TCHITREA NIGRICEPS EMINI (Reichenow)

Terpsiphone emini Reichenow, 1893, Orn. Monatsb., 1, p. 31: Bukoba, Victoria Nyanza, Tanganyika Territory.

♂ (M. C. Z. 148,637) Bukoba, Lake Victoria. 24. vi. 30.

TURDIDAE

TURDUS OLIVACEUS NYIKAE Reichenow

Turdus nyikae Reichenow, 1904, Orn. Monatsb., **12**, p. 95: Nyika Plateau, Nyasaland.

♂ ♀ (M. C. Z. 148,638-9) Kigogo, Uzungwe Mtns. 11-15. i. 30.

♀ (M. C. Z. 148,640) Nkuka Forest, Rungwe Mtn. 29. iii. 30.

Native name. *Namusosho* (Kinyika).

Breeding. The female specimen of the Nyika Olive Thrush from Kigogo was flushed from a nest on January 11, 1930. The nest was built into the central fork of a sapling at a height of about thirty feet from the ground according to Salimu who found it; he further stated that the sapling was of no greater proportions at its base than the thickness of a man's leg above the knee. It is a typical thrush nest composed of orchid roots and rich green moss lined with fine dry and dead grass. Outside diameter 150 mm. (6 inches), inside diameter 80 mm. (about 3 inches), outside depth 90 mm. (3½ inches), inside depth 50 mm. (2 inches). The two eggs are a rich sea-green blotched and smeared with chestnut brown; except for the brighter ground color they might be mistaken for the eggs of an English Blackbird. They measure 27 x 21 mm. and held well-developed embryos. The Rungwe bird is in immature plumage.

TURDUS (GEOKICHLA) GURNEYI OTOMITRA (Reichenow)

Geocichla gurneyi otomitra Reichenow, 1904, Orn. Monatsb., **12**, p. 95: Bulongwa, northeast of Lake Nyasa, Tanganyika Territory.

♂ ♂ (M. C. Z. 148,641-2) Madehani, Ukinga Mtns. 18-26. ii. 30.

Native name. *Kimukimu* (Kikinga).

Distribution. Bulongwa, the type locality of the Nyasa Orange Thrush, is scarcely six miles from Madehani by road and much less in a direct line. One bird is in the speckle-breasted juvenile plumage.

TURDUS (PSOPHOCICHLA) LITSIPSIRUPA STIERLINGI (Reichenow)

Geocichla litsipsirupa stierlingi Reichenow, 1900, Orn. Monatsb., **8**, p. 5: Iringa, Tanganyika Territory.

♂ ♂ ♀ (M. C. Z. 148,643-5) Ilolo, Rungwe. 4. iv. 30.

THAMNOLAEA ARNOTTI COLLARIS (Reichenow)

Myrmecocichla nigra var. *collaris* Reichenow, 1905, Vögel Afr., **3**, p. 707: no locality given; Kakoma, Tabora district, Tanganyika Territory (see Neunzig, 1926, Journ. f. Orn., p. 754).

♂ (M. C. Z. 148,646) Kitungulu, Urungu. 15. v. 30.

Variation. This bird is in immature plumage but shows indications that the crown of the head will be white when adult. Owing to its being a juvenile, we have identified it with this race partly on geographical grounds, as our locality lies to the southwest of Kakoma.

SAXICOLA TORQUATA PROMISCUA Hartert

Saxicola torquata promiscua Hartert, 1922, Bull. Brit. Orn. Club, **42**, p. 51: Uluguru Mtns., Tanganyika Territory.

♂ (M. C. Z. 148,647) Dabaga, Uzungwe Mtns. 28. xii. 29.

♂ ♀ ♀ (M. C. Z. 148,648-50) Kigogo, Uzungwe Mtns. 24. i. 30.

♂ (M. C. Z. 148,651) Mangoto, Ukinga Mtns. 10. ii. 30.

♂ (M. C. Z. 148,652) Igale, Poroto Mtns. 25. iv. 30.

Native name. *Kambasaa* (Kikinga).

These birds have been compared with a topotypic series of skins in the Museum of Comparative Zoölogy.

COSSYPHA HEUGLINI OCCIDENTALIS Reichenow

Cossypha heuglini occidentalis Reichenow, 1909, Journ. f. Orn., p. 108: Lufuku, west of Tanganyika.

♀ (M. C. Z. 148,653) Ujiji, Lake Tanganyika. 23. v. 30.

Affinities. We follow Friedmann, who has recently revised this species and its races, in recognising *occidentalis*. We have compared the Ujiji bird with Ruanda skins and find them inseparable.

COSSYPHA CAFRA IOLEMA Reichenow

Cossypha caffra iolema Reichenow, 1900, Orn. Monatsb., **8**, p. 5: East Africa; Kilimanjaro, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,654-5) Kigogo, Uzungwe Mtns. 16 & 31. i. 30.

♀ (M. C. Z. 148,656) Mangoto, Ukinga Mtns. 10. ii. 30.

♂ (M. C. Z. 148,657) Igale, Poroto Mtns. 28. iv. 30.

Native name. *Ndorora* (Kikinga).

Breeding. At Kigogo, on January 17, 1930, I flushed a bird from its nest composed of moss and built into a groove of the trunk of a huge forest tree at a height of six feet from the ground. The tree

was situated about twenty feet into the gloomy forest from the forest edge. The deep nest held two eggs almost on the point of hatching so the parent bird was not collected and the identification is a sight one. The ground color of the eggs was pale buff very inconspicuously tinged with rufous-brown except at the lesser pole; there were also a few minute brown flecks to be noted with the aid of a lens. The embryo from one egg was preserved, the other egg was left and the bird continued to sit.

BESSONORNIS ALBIGULARIS POROTOENSIS Bangs & Loveridge

Bessonornis albigularis porotoensis Bangs & Loveridge, 1931, Proc. New Eng. Zool. Club, **12**, p. 94: Igale, Poroto Mtns., Tanganyika Territory.

♀ (M. C. Z. 148,658) Nkuka Forest, Rungwe Mtn. 7. iv. 30.

♀ ♀ (M. C. Z. 148,659-60) Igale, Poroto Mtns. 28 & 30. iv. 30.

Native name. *Horora* (Kinyika, but also applied to *Batis* and *Sheppardia*).

Habitat. Since the discovery of *albigularis* thirty-five years ago, it has not been found elsewhere but on the Uluguru Mountains, therefore the occurrence of a smaller race on ranges far to the southwest of the Uluguru is of especial interest. The Poroto White-throated Robin-Chat frequents rain forest where there is ample undergrowth; in the junior author's recollection it is particularly associated with large patches of nettles. The type was shot on the western side of Igale Pass in the small patch of isolated forest bisected by the Tukuyu-Mbeya Road and close to his camp site.

SHEPPARDIA CYORNITHOPSIS SHARPEI (Shelley)

Callene sharpei Shelley, 1903, Bull. Brit. Orn. Club, **13**, p. 60: Masisi Hill, Nyika Plateau, Nyasaland.

Alethe sharpei Selater, 1930, Systema Avium Aethiopicarum, p. 480.

Sheppardia cyornithopsis sharpei Friedmann, 1930, Occ. Pap. Boston Soc. Nat. Hist., pp. 323-324.

♂ ♂ ♀ (M. C. Z. 148,661-3) Nkuka Forest, Rungwe Mtn. 2 & 14. iv. 30.

Native name. *Horora* (Kinyika but applied to the last species also).

Habitat. These birds were obtained not so very far distant from the type locality of *sharpei*, a race which we believe until now was only known from the unique type. They were shot by the junior author in the wet bamboo belt three hours walk up the trail from where it enters the lowest forest after passing through the Rungwe Mission coffee plantations. Sharpe's Akalat hops about among the broken

bamboos in a quiet and inconspicuous fashion which probably explains the small numbers that are taken by collectors.

ALETHE FÜLLEBORNI FÜLLEBORNI Reichenow

Alethe fülleborni Reichenow, 1900, Orn. Monatsb., 8, p. 99: "Peroto-Ngosi, Tandalla" *sic*. See note below.

♂ (M. C. Z. 148,664) Madehani, Ukinga Mtns. 15. ii. 30.

♂ ♂ ♀ ♀ (M. C. Z. 148,665-8) Nkuka Forest, Rungwe Mtn. 29. iii-7. iv. 30

Type locality. The unfortunate type locality given by Reichenow is also cited by Sclater; it is "Peroto-Ngosi, Tandalla." It may be that at the time of Fülleborn's visit the Tandala Mission was the most important European centre near Ngosi, but it is hardly probable for Tandala is a hard week's march from Ngosi Volcano and Tukuyu (formerly New Langenburg) only two days. It is more probable that the type was obtained on the march between Ngosi Volcano, Poroto Mountains and Tandala in the Ukinga Mountains; if this was the case then our birds are topotypes, for both Madehani and Rungwe lie on the road between these places. There is a typographical slip occurring four times on page 479 of the *Systema* where *fülleborni* is erroneously given as "*fülliborni*."

Native names. *Mesa* (Kikinga); *mwanjali* (Kinyakusa); *ndwekerigulumbwa* (Kinyika).

Affinities. This series of the White-chested Alethe has been compared with specimens of the northern race from the Uluguru Mountains and the differences are found to hold good.

Habitat. The White-chested Alethe is scarce and besides is difficult to shoot by reason of its fondness for hopping about on the forest floor where there is a dense tangled undergrowth. Having obtained one bird on the 29th of March I showed it to Salimu and told him to spend a day in an effort to secure more; it is due to his persistency and keenness that the others were shot on April 7.

POGONOCICHLA MARGARITIFERA JOHNSTONI Shelley

Pogonocichla johnstoni Shelley, 1893, Ibis, p. 18: Milanji Plateau, Nyasaland.

♀ (M. C. Z. 148,669) Dabaga, Uzungwe Mtns. 1. i. 30.

♀ ♀ (M. C. Z. 148,670-1) Kigogo, Uzungwe Mtns. 11-13. i. 30.

♂ ♂ ♀ (M. C. Z. 148,672-4) Madehani, Ukinga Mtns. 15-22. ii. 30.

♀ (M. C. Z. 148,675) Nkuka Forest, Rungwe Mtn. 5. iv. 30.

♂ (M. C. Z. 148,676) Tukuyu, Rungwe. 23. iv. 30.

♂ (M. C. Z. 148,677) Igale, Poroto Mtns. 30. iv. 30.

Native names. *Ndolola* (Kikinga); *siruwili* (Kinyika).

Affinities. This series was collected with a view to throwing light

upon the delimitation of *P. m. johnstoni* and its more northern (Uluguru and Usambara) relative *P. m. orientalis*. The whole series, however, agrees with the Nyasa White-starred Bush-Robin in having the outer edge of the primaries of an olivaceous color.

Though the Madehani birds are topotypic of Reichenow's *P. olivaceus*, they do not lack the black border to the outer tail feathers and Selater is probably correct in assuming that *olivaceus* only represents some juvenile phase of plumage. Two of our Madehani birds are young with speckling on the upper surface, thus differing strikingly from those obtained at Rungwe and Tukuyu, both of which are in juvenile plumage but are olivaceous green above with only the faintest trace of speckling. In this respect the latter compare well with young *P. m. orientalis* from the Uluguru Mountains. It would appear as if there is a uniform breeding season through the mountains of southwestern Tanganyika which commences in January and that the young birds collected exhibit a sequence of plumages.

Breeding. At Dabaga, on January 1, 1930, a nest measuring 130 x 110 x 80 mm. deep outside (approximately 4 x 5 x 3½ inches) and 70 x 60 mm. inside (2¾ x 2 inches), constructed of dead and skeletonized leaves, moss, grass, tendrils and sparsely lined with feathers. It held three slightly incubated eggs of a white ground color, one was distinctly greenish-white, heavily mottled with rufous-brown around the larger pole and decreasing towards the lesser pole. The eggs measured 20 x 14 mm. Female collected.

At Kigogo, on January 11, Salimu brought in a hen bird together with two fresh eggs less heavily mottled with rufous than those from the Dabaga clutch.

At Madehani fledglings were collected in mid-February and later stages of plumage farther south as related in the second paragraph on the affinities of this form.

SYLVIIDAE

*HIPPOLAIS OLIVETORUM (Strickland)

Salicaria olivetorum Strickland, 1837, in Gould's Birds Europe, 2, pl. 107: Zante.

♂ (M. C. Z. 148,678) Port Sudan, Red Sea. 16. x. 29.

When our vessel touched at Port Sudan on the outward voyage this bird was found lying in the road dead, but undamaged. At that time the vicinity of Port Sudan was alive with migrants. Van

Someren has recorded this Olive-tree Warbler from as far south as Teita in Kenya Colony.

ACROCEPHALUS BAETICATUS CINNAMOMEUS Reichenow?

Acrocephalus cinnamomeus Reichenow, 1908, Orn. Monatsb., **16**, p. 161: north side of Lake Albert Edward.

Breeding. When at Ujiji during the last week of May, 1930, many warblers, which the junior author took to be the Tropical African Reed-Warbler, were building their nests among the sedges which were growing out in the lake to the south of the town. Several nests were examined but no eggs were found, though the nests appeared quite ready to receive them.

*PHYLLOSCOPUS TROCHILUS TROCHILUS (Linnaeus)

Motacilla trochilus Linnaeus, 1758, Syst. Nat., **1**, 10th ed., p. 188: England (see Hartert, V. p. F., p. 507).

♂ ♀ (M. C. Z. 148,679-80) Kigogo, Uzungwe Mtns. 31. i. 30.

♂ (M. C. Z. 148,681) Ilolo, Rungwe. 15. iii. 30.

During the winter months the Willow Warbler is known to pass through East Africa and southwards as far as the Cape Province of South Africa.

SEICERCUS RUFICAPILLA JOHNSTONI W. Selater

Seicercus ruficapilla johnstoni W. Selater, 1927, Bull. Brit. Orn. Club, **48**, p. 13: Kombi, Masuku Range, 7,000 feet, northwestern Lake Nyasa, Northern Rhodesia.

3♂ 2♀ (M. C. Z. 148,682-6) Nkuka Forest, Rungwe Mtn. 25. iii-10. iv. 30.

♂ (M. C. Z. 148,687) Igale, Poroto Mtns. 25. iv. 30.

Native name. *Wetiti* (Kinyika, but also applied to *Zosterops*).

Distribution. According to Selater this race is only known from the Masuka Mountains but these are not far distant from the above localities. The Nyasa Yellow-throated Flycatcher-Warbler flies in flocks, visiting tree after tree of the smaller trees in the lower Nkuka Forest.

BRADYPTERUS USAMBARAE Reichenow

Bradypterus usambarae Reichenow, 1917, Journ. f. Orn., p. 391: Usambara Mtns., Tanganyika Territory.

- Bradypterus roehli* Grote, 1920, Orn. Monatsb., **28**, p. 6: Mlalo, near Lushoto, Usambara Mtns., Tanganyika Territory.
Turdinus spadix Friedmann, 1927, Proc. N. Eng. Zool. Club, **10**, p. 3: Nyingwa, Uluguru Mtns., Tanganyika Territory.

- ♂ ♂ (M. C. Z. 148,692-3) Kigogo, Uzungwe Mtns. 11 & 24. i. 30.
 3 ♀ (M. C. Z. 148,688-9, 148,694) Madehani, Ukinga Mtns. ii. 30.
 ♂ (M. C. Z. 148,690) Nkuka Forest, Rungwe Mtn. 10. iv. 30.
 ♂ (M. C. Z. 148,691) Igale, Poroto Mtns. 30. iv. 30.

Variation. This series, together with the holotype of *Turdinus spadix*, was sent to Dr. Stresemann at Berlin with the request that he compare them with the types of *B. usambarae* and *B. roehli*. His opinion was also asked as to what he thought of the light colored and the dark colored individuals that occur together in the same places and at the same seasons of the year. He replied that upon comparison he found that the names *usambarae*, *roehli* and *spadix* all refer to one and the same form.

As to the light and dark specimens, he agrees with us that if this really proves to have nothing to do with age and sex it can only be explained by the theory of dichromatism.

Habits. *Bradypterus* was found in the beds of nettles and tangled undergrowth in ravines in the rain forest. When one is in close proximity, the bird maintains a constant twittering but remains so well concealed that it is next to impossible to shoot. At most one catches only a fleeting glance as a bird darts from one patch of cover to another. Only after considerable difficulty and by the expenditure of much time did the junior author secure the series listed above; they were eventually obtained by getting a couple of natives to walk slowly through the clumps of nettles and thus drive out the birds.

APALIS THORACICA MURINA Reichenow

- Apalis murina* Reichenow, 1904, Orn. Monatsb., **12**, p. 28: Mararupia, Rovuma Valley, Tanganyika Territory.

- 3 ♀ (M. C. Z. 148,695-7) Madehani, Ukinga Mtns. 15-19. ii. 30.
 ♂ ♀ ♀ (M. C. Z. 148,698-700) Nkuka Forest, Rungwe Mtn. 25. iii-2. iv. 30.
 ♂ (M. C. Z. 148,701) Igale, Poroto Mtns. 30. iv. 30.

Native name. *Kaluambo* (Kikinga); *titi* (Kinyakusa).

APALIS THORACICA INTERJECTIVA Bangs & Loveridge

Apalis thoracica interjectiva Bangs & Loveridge, 1931, Proc. New Eng. Zoöl. Club, **12**, p. 95: Kigogo, Uzungwe Mtns., Tanganyika Territory.

♂ ♂ ♀ ♀ (M. C. Z. 148,702-5) Kigogo, Uzungwe Mtns. 16-28. i. 30.

The foregoing constitute the type series.

APALIS ALTICOLA (Shelley)

Cisticola alticola Shelley, 1899, Bull. Brit. Orn. Club, **7**, p. 35: "Nyasaland"; Fife, between Lakes Nyasa and Tanganyika, Northern Rhodesia.

♂ ♀ (M. C. Z. 148,706-7) Madehani, Ukinga Mtns. 14-18. ii. 30.

♀ (M. C. Z. 148,708) Tukuyu, Rungwe. 22. iv. 30.

Native name. *Kaukuswa* (Kikinga).

APALIS CHAPINI Friedmann

Apalis chapini Friedmann, 1928, Proc. New Eng. Zoöl. Club, **10**, p. 47: Nyingwa, Uluguru Mountains, 8,000 feet, Tanganyika Territory.

♂ 3 ♀ (M. C. Z. 148,709-12) Kigogo, Uzungwe Mtns. 13-24. i. 30.

Affinities. These four skins have been compared with the type male and female collected by the junior author in the Uluguru range at a slightly higher altitude.

CISTICOLA JUNCIDIS PERENNIA Lynes

Cisticola juncidis perennia Lynes, 1931, Ibis, p. 105: Mokia, Ruwenzori, Uganda.

♂ ♀ (M. C. Z. 148,713-4) Ujiji, Lake Tanganyika. 23. v. 30.

CISTICOLA LAIS SEMIFASCIATA Reichenow

Cisticola semifasciata Reichenow, 1905, Vög. Afr., **3**, p. 544: Tandala, southwestern Tanganyika Territory.

♂ (M. C. Z. 148,715) Kigogo, Uzungwe Mtns. 28. i. 30.

♂ (M. C. Z. 148,716) Iloilo, Rungwe. 15. iii. 30.

4 ♂ (M. C. Z. 148,717-20) Igale, Poroto Mtns. 25-30. iv. 30.

Native names. *Imbitila* (Kinyakusa); *kitorora* (Kinyika).

CISTICOLA CHENIANA VICTORIA Lynes

Cisticola cheniana victoria Lynes, 1931, Ibis, p. 264: Amala River, Kenya Colony.

♂ (M. C. Z. 148,980) Ukerewe Id., Lake Victoria. 13. vi. 30.

Native name. Zuzu (Kikerewe).

CISTICOLA NIGRILORIS Shelley

Cisticola nigriloris Shelley, 1897, Ibis, p. 536, pl. 12, fig. 2: Kombi, Masuku Range, northwest of Lake Nyasa, Northern Rhodesia.

♂ ♀ (M. C. Z. 148,722-3) Dabaga, Uzungwe Mtns. 28. xii. 29.

♂ ♀ (M. C. Z. 148,724-5) Kigogo, Uzungwe Mtns. 24. i. 30.

♀ (M. C. Z. 148,726) Madehani, Ukinga Mtns. 14. ii. 30.

♀ (M. C. Z. 148,727) Nkuka Forest, Rungwe Mtn. 5. iv. 30.

♂ ♀ ♀ (M. C. Z. 148,728-30) Igale, Poroto Mtns. 28-30. iv. 30.

Native names. *Ndidi* (Kikinga); *imbitiko* (Kinyakusa); *kapitila kanandi* (Kinyika); in Kikinga *sosolera* appears to be applied to the smaller species of grass warblers only.

CISTICOLA GALACTOTES SUAHELICA Neumann

Cisticola lugubris suahelica Neumann, 1905, Orn. Monatsb., **13**, p. 78: Begu, Bagamoyo District, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,731-2) Unyanganyi, Turu. 4. xii. 29.

CISTICOLA WOOSNAMI SCHUSTERI Reichenow

Cisticola schusteri Reichenow, 1913, Journ. für Ornith., p. 557: Uluguru Mtns., Tanganyika Territory.

♂ (M. C. Z. 148,721) Mwanza, Lake Victoria. 6. vi. 30.

PRINIA MISTACEA IMMUTABILIS v. Someren

Prinia mistacea immutabilis van Someren, 1920, Bull. Brit. Orn. Club, **40**, p. 93: Lake Nakuru, Kenya Colony.

♀ (M. C. Z. 148,733) Ukerewe Id., Lake Victoria. 13. vi. 30.

Native name. Lukira (Kikerewe).

PRINIA LEUCOPOGON REICHENOWI (Hartlaub)

Burnesia reichenowi Hartlaub, 1890, Journ. f. Orn., p. 151: Njangalo, northeastern Belgian Congo.

♂ ♀ (M. C. Z. 148,734-5) Bukoba, Lake Victoria. 24. vi. 30.

HIRUNDINIDAE

*HIRUNDO RUSTICA RUSTICA Linnaeus

Hirundo rustica Linnaeus, 1758, Syst. Nat., 10th ed., p. 191: Europe; restricted type locality, Sweden (Hartert, Novitates Zool., **29**, p. 210).

♂ ♀ (M. C. Z. 148,736-7) Bagamoyo. 11-14. xi. 29.

♂ 3 ♀ (M. C. Z. 148,738-41) Bulongwa, Ukinga Mtns. 13. ii. 30.

Native name. *Kilweve* (Kikinga, probably generic).

Variation. The Bagamoyo birds are peculiar, possibly they are from the same brood and migrated in the same flock. The male (November 11) has a white throat and white front and pure white underparts posterior to the black pectoral band—a semi-albino. The female (November 14) is normally colored as to the chestnut front and throat, but has pure white posterior underparts: also a semi-albino.

Migration records. At Iringa, on January 31, 1930, a large flock of European Swallows was observed flying over the English Hotel. At Mufindi, February 1, 1930, when motoring through open bush country, numbers of these birds were seen hawking flies. There were European Bee-eaters with them. When about half way between Mufindi and Njombe on February 6, 1930, at eventide, I saw many swallows and bee-eaters which appeared to be feeding. On leaving Bulongwa, February 13, 1930, a flock of about fifty birds were assembled on the telegraph wire flanking the Bulongwa-Madehani road. It was from this flock that the above series was shot.

HIRUNDO ATROCAERULEA Sundevall

Hirundo atrocaerulea Sundevall, 1850, Oefv. K. Sv. Vet.-Akad. Förh., **7**, p. 107: lower Caffraria; type from Umvoti, Natal.

♂ ♀ ♀ (M. C. Z. 148,742-4) Dabaga, Uzungwe Mtns. 2. i. 30.

♂ (M. C. Z. 148,745) Kigogo, Uzungwe Mtns. 24. i. 30.

Native name. *Nyanyamba* (Kihehe).

Breeding. At Dabaga, January 2, 1930, I saw a dozen Blue Swallows flying low on the hillside and occasionally disappearing from view; going to the place I found a large antbear burrow to the roof of which, but at a distance of about four feet from the entrance, there was attached a typical swallow's nest brimful of yellow-mouthed young.

At Kigogo, January 31, 1930, I watched a pair of these birds building beneath an overhanging bank immediately above a stream. An old nest was only a few feet away.

At Bulongwa, February 12, 1930, Blue Swallows were observed building in a similar situation to those at Kigogo.

HIRUNDO SMITHII SMITHII Leach

Hirundo smithii Leach, 1818, in App. Tuckey's Voy. Congo, p. 407: Chisalla Island, Congo.

Nestling (M. C. Z. 148,746) Tanganyika Territory. 1930.

The label had become detached so that the precise locality, believed to be Ukerewe Island, is uncertain.

HIRUNDO SENEGALENSIS MONTEIRI Hartlaub

Hirundo monteiri Hartlaub, 1862, Ibis, p. 340, pl. xi: Angola.

♂ (M. C. Z. 148,747) Kitungulu, Urungu. 15. v. 30.

Shot from a small party of half a dozen birds which were sunning themselves shortly after dawn on the bare branches of a baobab tree. Monteiro's Mosque-Swallow has already been recorded from Kitungulu by Kothe (1911) in his report on Fromm's collection.

RIPARIA PALUDICOLA DUCIS Reichenow

Riparia ducis Reichenow, 1908, Orn. Monatsb., 16, p. 81: western Ruanda.

♀ (M. C. Z. 148,748) Mwanza, Lake Victoria. 23. vi. 30.

Breeding. At Mwanza, June 9, 1930, an East African Sand-Martin was flushed from a hole situated a foot below the summit of a high cliff forming part of a quarry. On excavating the hole a new nest was found at the terminus but no eggs in it. On the 21st another bird was seen to be engaged in excavating a nest hole.

PSALIDOPROCNE PETITI ORIENTALIS Reichenow

Psalidoprocne petiti orientalis Reichenow, 1889, Journ. f. Orn., p. 277: Lewa, Dodoma District, Tanganyika Territory.

♂ (M. C. Z. 148,749) Tukuyu, Rungwe. 23. iv. 30.

CAMPEPHAGIDAE

CORACINA CAESIA PURA (Sharpe)

Graucalus purus Sharpe, 1891, Ibis, p. 121: Mt. Elgon.

♂ (M. C. Z. 148,750) Madehani, Ukinga Mtns. 18. ii. 30.

♂ ♀ ♀ (M. C. Z. 148,751-3) Nkuka Forest, Rungwe Mtn. 31. iii-14. iv. 30.

Native names. *Dakudaku* (Kikinga, possibly generic for shrikes); *murakititu* (Kinyakusa).

The Madehani bird lacked a tail before it was shot.

DICRURIDAE

DICRURUS ADSIMILIS DIVARICATUS (Lichtenstein)

Muscicapa divaricata Lichtenstein, 1823, Verz. Doubl. Zoöl. Mus. Berlin, p. 52: Senegal.

♀ (M. C. Z. 148,754) Masiliwa, Turu. 10. xii. 29.

♂ (M. C. Z. 148,981) Kitungulu, Urungu. 14. v. 30.

Breeding. At Saranda, November 29, 1929, I watched a Senegal Glossy-backed Drongo building.

At Masiliwa, December 10, 1929, a hen bird was flushed and shot from her nest which was built upon a horizontal fork of a tree; the nest, which was placed ten feet from the ground, measured 110 x 90 mm. by 30 mm. deep inside and was composed of fine twigs and root-lets bound together at the edges by cobwebs. It was so flimsy that the three eggs, which it held, could be seen from beneath. These eggs were white mottled with brown and purplish brown and measured 22 x 17 mm.; they were slightly incubated.

DICRURUS LUDWIGII LUDWIGII (Smith)

Edolius ludwigii Smith, 1834, S. Afr. Quart. Journ., 2d ser., p. 144: Port Natal; i. e. Durban, Natal.

♂ (M. C. Z. 148,755) Madehani, Ukinga Mtns. 15. ii. 30.

♂ ♀ (M. C. Z. 148,756-7) Nkuka Forest, Rungwe Mtn. 29. iii.-7. iv. 30.

Native name. *Suka* (Kinyakusa).

PRIONOPIDAE

EUROCEPHALUS RUEPPELLI BÖHMI Zedlitz

Eurocephalus anguitemens böhmi Zedlitz, 1913, Orn. Monatsb., p. 58: Unijamanga, Langenburg District (= Nyamwanga, Rungwe District), Tanganyika Territory.

♂ (M. C. Z. 148,758) Shinyanga, Usukuma. 3. vi. 30.

NILAUS NIGRITEMPORALIS Reichenow

Nilaus nigritemporalis Reichenow, 1892, Journ. f. Orn., p. 218: "Africa orientalis."

♂ ♀ (M. C. Z. 148,759-60) Bagamoyo. 11. xi. 29.

LANIIDAE

LANIUS COLLARIS HUMERALIS Stanley

Lanius humeralis Stanley, 1814, in Salt's Voyage to Abyssinia, App., p. 51: Chelicut, Ethiopia.

♂ (M. C. Z. 148,761) Kitungulu, Urungu. 14. v. 30.

♂ (M. C. Z. 148,762) Kasanga, Lake Tanganyika. 16. v. 30.

♂ ♀ (M. C. Z. 148,763-4) Ujiji, Lake Tanganyika. 23. v. 30.

LANIUS COLLARIS MARWITZI Reichenow

Lanius marwitzi Reichenow, 1901, Orn. Monatsb., 9, p. 90: Ngomingi, Uhehe District, Tanganyika Territory.

Breeding. At Dabaga, Uzungwe Mountains, January 1, 1930, a small boy showed me a nestling of the Uhehe Fiscal which he was carrying, one of four, he said, which he was going to eat.

LANIUS EXCUBITORIUS BÖHMI Reichenow

Lanius böhmi Reichenow, 1902, Journ. f. Orn., p. 258: Boga Katani, Ujiji District, Tanganyika Territory.

♀ (M. C. Z. 148,765) Ukerewe Id., Lake Victoria. 13. vi. 30.

Native name. *Nawagarra* (Kisukuma).

LANIARIUS ERYTHROGASTER (Cretzschmar)

Lanius erythrogaster Cretzschmar, 1829, in Rüppell, Atlas Vög., p. 43, pl. 29: Sennar, Sudan.

♂ (M. C. Z. 148,766) Mwanza, Lake Victoria. 6. iv. 30.

Distribution. Several Abyssinian Gonoleks were seen hopping about in the palms on the edge of the lake shore. Sclater gives Kenya Colony as the southernmost limits, but the junior author has previously obtained this species at Sagayo, Kome Island and Chantwara in the Mwanza and Bukoba districts of Tanganyika Territory.

LANIARIUS FUNEBRIS FUNEBRIS (Hartlaub)

Dryoscopus funebris Hartlaub, 1863, Proc. Zool. Soc. London, p. 105: Meninga, Unyamwezi, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,767-8) Kigogo, Uzungwe Mtns. 31. i. 30.

3 ♂ (M. C. Z. 148,769-71) Madehani, Ukinga Mtns. 14-26. ii. 30.

♂ (M. C. Z. 148,772) Igale, Poroto Mtns. 30. iv. 30.

♀ (M. C. Z. 148,773) Ukerewe Id., Lake Victoria. 11. vi. 30.

Native names. *Dakudaku* (Kikinga, possibly generic for shrike); *mwika* (Kikerewe).

LANIARIUS FERRUGINEUS MAJOR (Hartlaub)

Telephonus major Hartlaub, 1848, Rev. Zool., p. 108: Elmina, Gold Coast.

♂ ♂ ♀ (M. C. Z. 148,774-6) Dabaga, Uzungwe Mtns. 31. xii. 29.

♂ (M. C. Z. 148,777) Tukuyu, Rungwe. 21. iv. 30.

♂ ♂ ♀ (M. C. Z. 148,778-80) Ujiji, Lake Tanganyika. 23. v. 30.

Two of the Dabaga birds are in immature plumage. The beautiful call note of the West African Boubou was a common sound emanating from the thickets which are scattered through the mountainous grasslands of Dabaga.

LANIARIUS FERRUGINEUS SUBLACTEUS (Cassin)

Dryoscopus sublacteus Cassin, 1851, Proc. Acad. Nat. Sci. Phila., p. 246: East Africa.

♀ (M. C. Z. 148,781) Bagamoyo. 12. xi. 29.

DRYOSCOPIUS CUBLA HAMATUS Hartlaub

Dryoscopus hamatus Hartlaub, 1863, Proc. Zool. Soc. London, p. 106: Kaseh, Unyamwezi, Tanganyika Territory.

♂ ♀ (M. C. Z. 148,782-3) Bagamoyo. 14. xi. 29.

Breeding. A breeding pair of East African Puff-backs, the male with enlarged testes and the female with well-developed ovules.

DRYOSCOPIUS CUBLA ERWINI Sassi

Dryoscopus gambensis erwini Sassi, 1923, Orn. Monatsb., 31, p. 109: forest west of Lake Tanganyika.

♂ (M. C. Z. 148,784) Mwanza, Lake Victoria. 6. vi. 30.

TSCHAGRA AUSTRALIS CONGENER (Reichenow)

Pomatorhynchus australis congener Reichenow, 1902, Journ. f. Orn., p. 258: Neu-Helgoland, Songea District, Tanganyika Territory.

♂ (M. C. Z. 148,785) Tukuyu, Rungwe. 22. iv. 30.

CHLOROPHONEUS SULFUREOPECTUS SIMILIS (Smith)

Malaconotus similis Smith, 1836, Rep. Exp. Centr. Afr., p. 44: north of Kurri-chane, i. e. Rustenberg District, Transvaal.

♂ (M. C. Z. 148,786) Mangasini, Usandawi. 16. xii. 29.

CHLOROPHONEUS NIGRIFRONS MANNINGI (Shelley)

Malaconotus manningi Shelley, 1899, Bull. Brit. Orn. Club, 8, p. 35: Nyasa-Tanganyika Plateau.

♀ (M. C. Z. 148,787) Madehani, Ukinga Mtns. 14. ii. 30.

♂ ♀ (M. C. Z. 148,788-9) Igale, Poroto Mtns. 25-30. iv. 30.

Native name. *Dolola* (Kikinga).

Affinities. We have compared these topotypic specimens of the Nyasa Black-fronted Bush-Shrike with typical *nigrifrons* from the Uluguru Mountains from which they are readily distinguishable by the richer orange shading of the breast.

Habitat. These handsome birds were shot in heavy forest, where they were seen hopping about in the epiphytic growths at a height of from thirty to sixty feet above the ground.

PARIDAE

PARUS NIGER INSIGNIS Cabanis

Parus (Pentheres) insignis Cabanis, 1880, Journ. f. Orn., p. 419: southwest Africa (=Malanji, Angola, see Reichenow, 1905, Vögel Afr., 3, p. 513).

♀ (M. C. Z. 148,790) Bagamoyo. 12. xi. 29.

♂ ♂ ♀ (M. C. Z. 148,791-3) Dabaga, Uzungwe Mtns. 2. i. 30.

♂ (M. C. Z. 148,794) Igale, Poroto Mtns. 29. iv. 30.

Distribution. These records, particularly that from Bagamoyo, extend the known range of this form considerably, for, hitherto, the only Tanganyika record was Reichenow's type of *P. n. fuelleborni* from Undis, Songea district. Should the latter eventually prove to be distinct, then *fuelleborni* would probably be the race to which the above listed specimens belong; we have no other material of *insignis* for comparison.

CORVIDAE

CORVUS ALBUS Müller

Corvus albus P. L. S. Müller, 1776, Syst. Nat., Suppl., p. 85: Senegal.

♂ ♀ (M. C. Z. 148,795-6) Ujiji, Lake Tanganyika. 26. v. 30.

Native name. *Lihobe* (Kikinga but also applied to the next species); *nkonguu* (Kinyaturu).

Breeding. At Bagamoyo, November 10, 1929, I watched a pair of these birds building in a palm tree close to camp. As seen through field glasses, one was busily stalking about gathering coconut fibre while the other cawed continually except when he (?) occasionally picked up a large piece which he carried from place to place but never took up to the nest. The nest was examined on November 13 and was still empty. On the morning of our departure, November 18, it was again examined and found to contain three fresh eggs of the usual type.

At Unyanganyi, December 4, 1930, a crow was found sitting on a clutch consisting of two of her own eggs and five eggs of the Great Spotted Cuckoo (*Clamator glandularius*), under which species a full account of the incident has already been recorded.

At Unyanganyi, December 7, 1929, another nest was examined and found to contain four fledglings; this nest was also in a baobab, but others were seen in Bussu palms and these were safe from investigation.

At Dodoma, December 24, 1929, a native youngster brought a number of fledglings in a gasoline drum and offered them for sale. It was surprising to find the species nesting for at the same time hundreds of Pied Crows were assembling nightly, with much commotion, to roost in some large trees growing in the dry water course near the pumping station at Kikuyu, a couple of miles south of Dodoma. I surmise that the nestlings seen were of a late hatching and that the majority of birds were already fledged and roosting in flocks with their parents.

At Shinyanga, June 3, 1930, half a dozen tree frogs (*Chiromantis p. petersi*) were found aestivating in an empty crow's nest at the very top of a baobab. The dry season had commenced already and the weather was very hot.

Diet. I found ground nuts and mouse fur in the stomach of the female Pied Crow killed at Ujiji and listed above.

CORVULTUR ALBICOLLIS (Latham)

Corvus albicollis Latham, 1790, "Ind. Orn.," p. 151: Africa.

♂ ♂ ♀ ♀ (M. C. Z. 148,797-800) Madehani, Ukinga Mtns. 19-20. ii. 30.

♂ (M. C. Z. 148,801) Igale, Poroto Mtns. 29. iv. 30.

Native name. *Lihobe* (Kikinga, but also applied to the preceding species.)

Diet. The Igale bird had its stomach full of maize.

Enemies. See note under *Sprco bicolor* following.

STURNIDAE

CINNYRICINCLUS LEUCOGASTER LAURAGRAYAE Bowen

Cinnyricinclus leucogaster lauragrayae Bowen, 1930, Proc. Acad. Nat. Sci. Phila., **82**, p. 166: Meru, Kenya Colony.

♀ (M. C. Z. 148,802) Dabaga, Uzungwe Mtns. 28. xii. 29.

♂ ♀ (M. C. Z. 148,805-6) Ukerewe Id., Lake Victoria. 12. vi. 30.

Native name. *Bugome* (Kikerewe).

LAMPROTORNIS PURPUROPTERUS PURPUROPTERUS Rüppell

Lamprotornis purpuropterus Rüppell, 1845, Syst. Uebers., pp. 64, 75, pl. 25: Shoa, Ethiopia.

♂ ♀ ♀ (M. C. Z. 148,805-7) Ukerewe Id., Lake Victoria. 12. vi. 30.

Native name. *Nmwika* (Kikerewe).

ONYCHOGNATHUS WALLERI NYASAE (Shelley)

Amydrus nyasae Shelley, 1898, Ibis, p. 557: Nyasaland.

3 ♂ (M. C. Z. 148,808-9, 148,982) Kigogo, Uzungwe Mtns. 13-18. i. 30.

♂ (M. C. Z. 148,810) Madehani, Ukinga Mtns. 18. ii. 30.

♂ ♂ (M. C. Z. 148,811-2) Nkuka Forest, Rungwe Mtn. 1. iv. 30.

Native names. *Mulea* (Kikinga); *ingulio* (Kinyakusa, Kinyika).

Affinities. Unfortunately our topotypic specimens of *O. w. walleri* from the Usambara Mountains, as well as three from the Uluguru, are all females, so that we are unable to compare the present series with them. These birds have, therefore, been named solely on geographical grounds.

Habitat. The Nyasa Chestnut-wing occurs in the forests chiefly

at the very summit of the mountains where they descend in flocks upon any fruit-bearing trees. Despite their noisy whistling cries, these birds are sufficiently wary as to be rather difficult to secure.

ONYCHOGNATHUS MORIO SHELLEYI (Hartert)

Amydrus morio shelleyi Hartert, 1891, Kat. Vogelsam. Mus. Senck., p. 75 note: Ugogo, Tanganyika Territory.

♂ (M. C. Z. 148,813) Kikuyu, Ugogo. 23. xii. 29.

♀ (M. C. Z. 148,814) Madehani, Ukinga Mtns. 14. ii. 30.

ONYCHOGNATHUS TENUIROSTRIS (Rüppell)

Lamprotnis tenuirostris Rüppell, 1836, N. Wirbelt., Vög., p. 26, pl. 10, fig. 1: Ethiopia.

♀ (M. C. Z. 148,815) Kigogo, Uzungwe Mtns. 14. i. 30.

SPREO SUPERBUS (Rüppell)

Lamprocolius superbus Rüppell, 1845, Syst. Uebers., pp. 65, 75, pl. 26: Shoa, Ethiopia.

Habits. At Dodoma, November 25, 1929, a pair of Superb Starlings were seen to be vigorously persecuting a White-necked Raven (*Corvultur albicollis*) which, perched upon the metal roof-ridge of the galvanized iron roof of the hotel, had the greatest difficulty in keeping its balance as it stabbed, or pecked, at its assailants who swooped past its head or, by menacing it suddenly from behind, caused it to go slipping down the roof.

At Saranda, November 28, 1929, a flock of these starlings engaged in mobbing a Spotted Eagle Owl (*Bubo africanus africanus*).

ZOSTEROPIDAE

ZOSTEROPS VIRENS STIERLINGI Reichenow

Zosterops stierlingi Reichenow, 1899, Journ. f. Orn., p. 418: Iringa, Uhehe, Tanganyika Territory.

5♂ 1♀ (M. C. Z. 148,816-21) Kigogo, Uzungwe Mtns. 16-28. i. 30.

3♂ 2♀ 1 unsexed (148,822-7) Madehani, Ukinga Mtns. 14-19. ii. 30.

Habits. At the time of our visit, the Uhehe Green White-eyes were encountered singly or in pairs in the little patches of bush or forest scattered through the Uhehe highlands.

Affinities. While the series from Kigogo are typical *stierlingi*, as might be expected for they are nearly topotypic, those from Madehani are somewhat intermediate between *stierlingi* and the more southern form which we describe as new. Madehani birds, however, are definitely closer to *stierlingi* than to the new race.

ZOSTEROPS VIRENS SARMENTICIA Bangs & Loveridge

Zosterops virens sarmenticia Bangs & Loveridge, 1931, Proc. New Eng. Zoöl. Club, 12, p. 95: Igale, Poroto Mtns., Tanganyika Territory.

3 ♂ ♀ (M. C. Z. 148,829-31) Nkuka Forest, Rungwe Mtn. 8-14. iii. 30.

♀ (M. C. Z. 148,832) Tukuyu, Rungwe. 23. iv. 30.

4 ♂ 4 ♀ (M. C. Z. 148,833-40) Igale, Poroto Mtns. 25-30. iv. 30.

Measurements

Igale 4 males, wings 58-61 mm.; bills to base of foreheads 13-14 mm.

Igale 4 females, wings 56-58 mm.; bills to base of foreheads 12-13 mm.

Tukuyu 1 female, wing 58 mm.; bills to base of foreheads 12.5 mm.

Rungwe 1 female, wing 58 mm.; bills to base of foreheads 12.5 mm.

Rungwe 3 males, wings 58-59 mm.; bills to base of foreheads 13 mm.

NECTARINIIDAE

NECTARINIA FAMOSA FAMOSA (Linnaeus)

Certhia famosa Linnaeus, 1766, Syst. Nat., 12th ed., 1, p. 187: Cape of Good Hope, South Africa.

♂ (M. C. Z. 148,841) Kigogo, Uzungwe Mtns. 31. i. 30.

♂ ♂ (M. C. Z. 148,842-3) Mangoto, Ukinga Mtns. 10. ii. 30.

Native name. *Kalusongwe* (Kikinga for sunbird).

Distribution. Both these records for typical Malachite Sunbirds are somewhat northwest of their known range which, according to Selater, extends to the mountains northwest of Lake Nyasa. Kothe recorded it from Igale when reporting on the Hauptmann-Fromm collection in 1911. The junior author saw Malachite Sunbirds several times on the outskirts of the Nkuka Forest on Rungwe Mountain.

Affinities. As might be expected, the Kigogo and Mangoto birds are rather more bluish than a Natal bird which we have for comparison, and are, therefore, somewhat intermediate between the typical form and *N. f. aeneigularis* of the Kenya highlands. The Kigogo bird is only assuming adult plumage.

NECTARINIA KILIMENSIS ARTURI P. L. Slater

Nectarinia arturi P. L. Slater, 1906, Bull. Brit. Orn. Club, **19**, p. 30: Wolverhampton, S. Melsetter District, Southern Rhodesia.

♂ (M. C. Z. 148,844) Dabaga, Uzungwe Mtns. 31. xii. 29.

♂ (M. C. Z. 148,845) Kigogo, Uzungwe Mtns. 31. i. 30.

♂ (M. C. Z. 148,846) Mangoto, Ukinga Mtns. 10. ii. 30.

♂ (M. C. Z. 148,847) Tukuyu, Rungwe. 23. iv. 30.

Native name. *Kalusongwe* (Kikinga for sunbird).

Affinities. While referring these birds to the Mashonaland Bronzy Sunbird, of which we have no specimens available for comparison, it might be remarked that they agree fairly closely with examples of *N. k. filiola* from Lulenga, Belgian Congo in the Museum of Comparative Zoölogy collection, but show more reddish purple iridescence than does that form.

NECTARINIA ERYTHROCERCA ERYTHROCERCA Hartlaub

Nectarinia erythrocerca Hartlaub, 1857, Syst. Orn. Westafr., p. 270: no locality; White Nile, south of 8° N. L. (*vide* Heuglin).

♂ (M. C. Z. 148,848) Bukoba, Lake Victoria. 24. vi. 30.

NECTARINIA MELANOGASTRA MELANOGASTRA Fischer & Reichenow

Nectarinia melanogastra Fischer & Reichenow, 1884, Journ. f. Orn., p. 181: Nguruman, Lake Natron, Tanganyika Territory.

♂ (M. C. Z. 148,849) Unyanganyi, Turu. 4. xii. 29.

♂ (M. C. Z. 148,850) Mangasini, Usandawi. 13. xii. 29.

Habits. Both these sunbirds were shot when feeding at the blossoms of the huge baobab trees, which latter are quite a feature of the arid thorn-bush country of the Central Province.

CINNYRIS CUPREUS CUPREUS (Shaw)

Certhia cuprea Shaw, 1811, Gen. Zoöl., **8**, p. 201: Malimba, Gaboon.

♂ (M. C. Z. 148,851) Ujiji, Lake Tanganyika. 26. v. 30.

♂ (M. C. Z. 148,852) Bukoba, Lake Victoria. 24. vi. 30.

Affinities. Both these Coppery Sunbirds are in eclipse plumage but have been compared with a typical bird (M.C.Z. 97,599) from Beni in the eastern Congo.

Distribution. The above records somewhat complete the range

which, as defined by Selater, is "Senegal to the Congo, and east through Belgian Congo to the Nile, Sennar, S. W. Abyssinia, and in the south to Northern Rhodesia and Nyasaland."

CINNYRIS BIFASCIATUS BIFASCIATUS (Shaw)

Certhia bifasciata Shaw, 1811, Gen. Zoöl., 8, p. 198: Malimba, Gaboon.

♂ (M. C. Z. 148,853) Ukerewe Id., Lake Victoria. 11. vi. 30.

Native name. *Kasonsoni* (Kikerewe).

Affinities. This Little Purple-banded Sunbird has been compared with specimens of *forma typica* and an example of *C. b. microrhynchus* from Mombasa.

CINNYRIS MARIQUENSIS SUAHELICUS Reichenow

Cinnyris suahelica Reichenow, 1891, Journ. f. Orn., p. 161: Tabora District, Tanganyika Territory.

♂ (M. C. Z. 148,854) Mangasini, Usandawi. 12. xii. 29.

Distribution. This example of the Swahili Mariqua Sunbird was shot almost exactly a hundred and fifty miles due east of the type locality.

CINNYRIS VENUSTUS FALKENSTEINI Fischer & Reichenow

Cinnyris falkensteini Fischer & Reichenow, 1884, Journ. f. Orn., p. 56: Lake Naivasha, Kenya Colony.

♂ (M. C. Z. 148,855) Mangasini, Usandawi. 13. xii. 29.

♂ (M. C. Z. 148,856) Kigogo, Uzungwe Mtns. 28. i. 30.

♂ (M. C. Z. 148,857) Ilolo, Rungwe. 8. iv. 30.

♀ (M. C. Z. 148,858-9) Igale, Poroto Mtns. 29. iv. 30.

Native name. *Sombio* (Kinyakusa).

Affinities. The Igale Kenya Buff-breasted Sunbirds are from the area of intergradation between *C. v. falkensteini* and *C. v. niassae*.

CINNYRIS MEDIOCRIS FÜLLEBORNI Reichenow

Cinnyris fülleborni Reichenow, 1899, Orn. Monatsb., 7, p. 7: Kalinga, Iringa District, Tanganyika Territory.

3♂ ♀ ♀ (M. C. Z. 148,860-4) Kigogo, Uzungwe Mtns. 13-28. i. 30.

♂ ♀ (M. C. Z. 148,865-6) Madehani, Ukinga Mtns. 14-17. ii. 30.

♂ (M. C. Z. 148,867) Nkuka Forest, Rungwe Mtn. 18. iv. 30.

9♂ ♀ ♀ (M. C. Z. 148,868-82) Igale, Poroto Mtns. 25-30. iv. 30.

Native name. *Kalusongwe* (Kikinga for sunbird).

Habitat. The Iringa Double-collared Sunbird was so scarce in, or on, the outskirts of the Nkuka Forest that only one specimen was seen and that on the day of departure as we were awaiting the arrival of the porters. It favors more open country and was extraordinarily abundant among the blossoms bordering the road where it passes through the forest on Igale Pass.

CHALCOMITRA SENEGALENSIS AEQUATORIALIS (Reichenow)

Cinnyris aequatorialis Reichenow, 1899, Orn. Monatsb., **7**, p. 171: Bukoba, Lake Victoria, Tanganyika Territory.

♀ (M. C. Z. 148,883) Unyanganyi, Turu. 5. xii. 29.

♂ (M. C. Z. 148,884) Ukerewe Id., Lake Victoria. 13. vi. 30.

Native name. *Kasonsoni* (Kikerewe).

Sex. The Unyanganyi example of this Scarlet-chested Sunbird was labelled "♀, see note." by the junior author, who was evidently satisfied in the field that it was a female though in adult cock plumage. Unfortunately no note was made and there remains the possibility that the body produced by the skinners may have been that of another bird.

CYANOMITRA VERTICALIS NIASAE (Reichenow)

Chalcomitra verticalis niassae Reichenow, 1910, Orn. Monatsb., **18**, p. 174: Rutengano, Kondeland, northwest of Lake Nyasa.

♂ (M. C. Z. 148,885) Tukuyu, Rungwe. 31. iv. 30.

♀ (M. C. Z. 148,886) Igale, Poroto Mtns. 28. iv. 30.

Affinities. Unfortunately these two birds are in immature plumage and, therefore, impossible to place subspecifically. As, however, they come from very near the type locality of *niassae* we refer them to that form, which Selater thinks is very probably a synonym of *C. v. cyanocephala* described from Malimba, Gaboon. On the other hand, Kothe, in 1911, refers a male collected by Fromm at Tukuyu (New Langenburg) to *C. viridisplendens*, now considered a race of *verticalis*, of Bukoba.

ANTHREPTES COLLARIS UGANDAE van Someren

Anthreptes collaris ugandae van Someren, 1921, Bull. Brit. Orn. Club, **41**, p. 113: Maraquet, Uganda.

♀ (M. C. Z. 148,887) Ukerewe Id., Lake Victoria. 11. vi. 30.

Native name. *Kasonsoni* (Kikerewe for sunbird).

PLOCEIDAE

PASSER GRISEUS SUAHELICUS Reichenow

Passer griseus suahelicus Reichenow, 1904, Vögel Afr., **3**, p. 231: Busisi, Mwanza District, Tanganyika Territory.

3 ♂ ♀ ♀ (M. C. Z. 148,888-92) Ujiji, Lake Tanganyika. 27-28. v. 30.

♂ (M. C. Z. 148,893) Shinyanga, Usukuma. 2. vi. 30.

♂ (M. C. Z. 148,894) Mwanza, Lake Victoria. 6. vi. 30.

Native name. *Siantali* (Kikerewe).

PLOCEUS NIGRICOLLIS NIGRICOLLIS (Vieillot)

Malimbus nigricollis Vieillot, 1805, Ois. Chant., p. 74, pl. 45: Malimba, Gaboon.

♂ (M. C. Z. 148,898) Bukoba, Lake Victoria. 24. vi. 30.

PLOCEUS XANTHOPS CAMBURNI (Sharpe)

Hyphantornis camburni Sharpe, 1890, Bull. Brit. Orn. Club, **10**, p. 35: Mt. Kenya, Kenya Colony.

♂ (M. C. Z. 148,901) Kitungulu, Urungu. 14. v. 30.

PLOCEUS XANTHOPTERUS (Finsch & Hartlaub)

Hyphantornis xanthopterus Finsch & Hartlaub, 1870, Vög. Ost.-Afr., p. 399: Shupanga.

♂ ♂ (M. C. Z. 148,899-900) Mwaya, Lake Nyasa. 6-7. iii. 30.

Breeding. On March 7, 1930 a number of Zambesi Brown-throated Weavers were hovering about their nests of coarsely-woven grass suspended from a thorny bush growing out in Lake Nyasa near Mwaya; the bush was about thirty feet from the shore. Many of the nests contained young, but I collected one measuring 110 mm. which held two very slightly incubated eggs. These eggs are a pale sap-green minutely speckled with grey-brown over the whole surface, they measure 21 x 14 mm.

PLOCEUS CASTANOPS Shelley

Ploceus castanops Shelley, 1888, Proc. Zoöl. Soc. London, p. 35: Wadelai, Uganda.

♂ (M. C. Z. 148,902) Bukoba, Lake Victoria. 24. vi. 30.

PLOCEUS STUHLMANNI SHARPII (Shelley)?

Otyphantes sharpii Shelley, 1898, Ibis, p. 557: Nyasaland.

♂ (M. C. Z. 148,903) Dabaga, Uzungwe Mtns. 31. xii. 29.

Our example of the Uhehe Stuhlmann's Weaver is in immature plumage and has been determined with some doubts by Dr. Friedmann.

PLOCEUS CAPITALIS FISCHERI Reichenow?

Ploceus fischeri Reichenow, 1887, Journ. Orn., p. 69; Kagehi, southern end of Lake Victoria, Tanganyika Territory.

♂ (M. C. Z. 148,905) Ujiji, Lake Tanganyika. 23. v. 30.

This is another immature bird kindly identified for us, but with reservations, by Dr. Friedmann. Sclater considers that *fischeri* is a synonym of *P. c. dimidiatus* Antinori & Salvadori.

PLOCEUS JACKSONI Shelley

Ploceus jacksoni Shelley, 1888, Ibis, p. 293, pl. 7: Kilimanjaro; probably Lake Jipé, near Kilimanjaro, Tanganyika Territory.

♂ (M. C. Z. 148,895) Mwanza, Lake Victoria. 6. vi. 30.

♀ (M. C. Z. 148,904) Ujiji, Lake Tanganyika. 23. v. 30.

The identification of the female has been tentatively made by Dr. Friedmann who was engaged in studying the weaver birds at the time.

PLOCEUS OCULARIUS CROCATUS (Hartlaub)

Hyphantornis crocata Hartlaub, 1881, Abhandl. Nat. Ver. Bremen, 7, p. 100: Magungo, Victoria Nile.

♂ (M. C. Z. 148,896) Tukuyu, Rungwe. 22. iv. 30.

♀ (M. C. Z. 148,897) Kitungulu, Urungu. 14. v. 30.

Distribution. Though these localities, which are intermediate in position between the ranges of two forms, are far east for *crocatu*s, the birds themselves appear to belong to that form rather than to *P. ocularius ocularius* of South Africa.

QUELEA QUELEA AETHIOPICA (Sundevall)

Ploceus aethiopicus Sundevall, 1850, Oefv. K. Sv. Vet.-Akad. Förh., 7, p. 126: Sennar, Sudan.

♀ (M. C. Z. 148,906) Unyanganyi, Turu. 4. xii. 29.

♀ (M. C. Z. 148,907) Ujiji, Lake Tanganyika. 23. v. 30.

EUPLECTES HORDACEA SYLVATICA (Neumann)

Pyromelana flammiceps sylvatica Neumann, 1905, Journ. f. Orn., p. 345: Jaunde, Cameroon.

♀ (M. C. Z. 148,912) Shinyanga, Usukuma. 2. vi. 30.

Native name. Magubu (Kikerewe).

Affinities. We are indebted to Dr. Friedmann for identifying this bird which the junior author assumed was the female of the next species, for he shot it within ten yards of the cock *Euplectes gierowii friederichseni*. As regards the breeding note there is no doubt as to the identification of the species.

Breeding. At Mwaya, March 1, 1930, a nest containing two eggs was found attached to tall elephant grass growing near my tent, the nest was placed some nine feet from the ground. I drew the grass down to feel the eggs, the cock bird witnessing the act. I decided to leave the clutch to ascertain the period of incubation. However, on examining the nest two days later I found the eggs gone and the entrance to the nest more or less wrecked, apparently having been done by the birds themselves.

At Nyamkolo, May 10, 1930, many nests were found in process of construction and the birds actually observed engaged in building. These nests were attached to sedges growing in Lake Tanganyika and were placed about six feet above the level of the water which was three feet deep at that spot. One nest held three hard set eggs, another contained nestlings, while from another—to judge by the dirt in the bottom of the nest—the young had recently flown.

EUPLECTES GIEROWII FRIEDERICHSENI Fischer & Reichenow

Euplectes friederichseni Fischer & Reichenow, 1884, Journ. f. Orn., p. 54: Nguruman, Lake Natron, Tanganyika Territory.

♀ (M. C. Z. 148,908) Unyanganyi, Turu. 6. xii. 29.

3 ♀ (M. C. Z. 148,909–10, 148,913) Ujiji, Lake Tanganyika. 23.v.30.

♂ (M. C. Z. 148,901) Shinyanga, Usukuma. 2. vi. 30.

Affinities. The Unyanganyi and Ujiji birds are identified with

reservations and the determinations should be accepted with caution until adult males have been recorded from these places.

UROBRACHYA AXILLARIS ZANZIBARICA Shelley

Urobrachya zanzibarica Shelley, 1881, Proc. Zoöl. Soc. London, p. 586, pl. 30, fig. 1: Malinda, i. e. Malindi, Kenya Colony.

3 ♂ (M. C. Z. 148,914-6) Mwaya, Lake Nyasa. 7-8. iii. 30.

Distribution. Typical *axillaris* occurs from South Africa north to Nyasaland and one would naturally expect the Mwaya birds to belong to that form. This does not appear to be the case, however, and we must refer them to *zanzibarica* whose range, according to Sclater, is "Coastal districts of Eastern Africa from Lamu, south to the Rufigi; not known from Zanzibar Island."

COLIUSPASSER MACROURUS CONRADSI Berger

Coliuspasser macroura conradsi Berger, 1908, Journ. f. Orn., p. 487: Ukerewe Island, Lake Victoria, Tanganyika Territory.

4 ♂ ♀ (M. C. Z. 148,917-21) Ukerewe Id., Lake Victoria. 11-13. vi. 30.

Native name. *Magubu* (Kikerewe).

Breeding. A nest and two eggs of the Ukerewe Yellow-mantled Whydah were brought in by Salimu, but unfortunately a rat entered my tent during the night and destroyed the eggs to eat the contents. Both nest and eggs closely resembled those of the Tanganyika race of *Coliuspasser ardens*, the eggs being green mottled with brown.

COLIUSPASSER HARTLAUBI PSAMMOCROMIUS (Reichenow)

Penthetia psammocromia Reichenow, 1900, Orn. Monatsb., p. 39: Tandala, northeastern Lake Nyasa, Tanganyika Territory.

3 ♂ ♀ ♀ (M. C. Z. 148,922-6) Dabaga, Uzungwe Mtns. 30-31. xii. 30.

♂ ♀ (M. C. Z. 148,927-8) Mangoto, Ukinga Mtns. 10. ii. 30.

♂ (M. C. Z. 148,929) Madehani, Ukinga Mtns. 21. ii. 30.

Native name. *Nyerbeta* (Kikinga).

Habitat. Tandala, the type locality of the Nyasa Marsh-Whydah, lies between Mangoto and Madehani and a night was spent there on the march to Madehani. This whydah is a common species throughout the southwestern highlands wherever sedge-grown swampy bottoms occur among the hills. It occurs close to *Coliuspasser ardens concolor*, a species that was seen at Tandala and at many points along the route.

SPERMESTES CUCULLATUS SCUTATUS Heuglin

Spermestes scutatus Heuglin, 1863, Journ. f. Orn., p. 18: Dembea, Ethiopia.

♂ ♂ ♀ ♀ (M. C. Z. 148,930-3) Kitungulu, Urungu. 14-15. v. 30.

♂ ♂ (M. C. Z. 148,934-5) Bukoba, Lake Victoria. 24. vi. 30.

Breeding. A nest of the Ethiopian Bronze Mannikin containing eight fresh eggs was brought to me at Ukerewe Island on June 17, 1930. The nest was placed in the cage of an Egg-eating Snake (*Dasy-peltis scaber*) which made short work of the clutch, as also of two eggs of this species recovered from the stomach of a Boomslang (*Dispholidus typus*) which fell from a mango tree in which there were several nests of these mannikins.

CRYPTOSPIZA REICHENOWI OCULARIS Sharpe

Cryptospiza ocularis Sharpe, 1902, Bull. Brit. Orn. Club, **13**, p. 8: Ruwenzori, Uganda.

♀ (M. C. Z. 148,936) Kigogo, Uzungwe Mtns. 18. i. 30.

♂ ♀ (M. C. Z. 148,937-8) Madehani, Ukinga Mtns. 20-21. ii. 30.

4 ♂ (M. C. Z. 148,939-42) Igale, Poroto Mtns. 25-30. iv. 30.

Native name. *Kilutundulu* (Kikinga).

PYTILIA MELBA BELLI Ogilvie-Grant

Pytilia belli Ogilvie-Grant, 1907, Bull. Brit. Orn. Club, **21**, p. 14: southeast Ruwenzori; type from Mokia, Toro District, Uganda.

♂ ♀ (M. C. Z. 148,943-4) Unyanganyi, Turu. 4. xii. 29.

Affinities. The Central African Melba was not seen during the brief stay made on Ukerewe Island, the type locality of *P. m. conradsi*, a form, however, which Selater considers synonymous with *P. m. belli*.

LAGONOSTICTA SENEGALA RUBERRIMA Reichenow

Lagonosticta brunneiceps ruberrima Reichenow, 1903, Orn. Monatsb., **11**, p. 24: Bukoba, Victoria Nyanza, Tanganyika Territory.

♂ (M. C. Z. 148,945) Mwya, Lake Nyasa. 10. iii. 30.

♀ (M. C. Z. 148,946) Igale, Poroto Mtns. 28. iv. 30.

♂ (M. C. Z. 148,947) Ujiji, Lake Tanganyika. 28. iv. 30.

♂ ♀ (M. C. Z. 148,948-9) Bukoba, Lake Victoria. 24. vi. 30.

Affinities. The Bukoba birds are topotypic of this race, the cock compares well with those from Ujiji and Mwya excepting that both

the latter show rather more white speckling on their flanks. Perhaps the Igale and Mwaya birds should be referred to the southern race *L. s. rendallii* from the Upper Shire, a form of which we have no material for comparison.

Breeding. At Mwaya, March 5, 1930, some Banyakusa in removing a pile of dried grass, stacked for thatching, uncovered a nest of the Bukoba Red-billed Fire-Finch which had been built into the grass. The nest, measuring approximately 80 mm. in outside height and 120 mm. in horizontal diameter, was a loose assemblage of dry sedge-like coarse grass outside, while within was fibre and fine grass and a lining of fowl feathers. The four white eggs which it contained were in a very advanced stage of incubation; they measured 13 x 10 mm.

ESTRILDA ASTRILDA NYASSAE Neumann

Estrilda astrilda nyassae Neumann, 1907, Journ. f. Orn., p. 596: Neu-Helgoland, Songea District, Tanganyika Territory.

♂ ♂ ♀ (M. C. Z. 148,950-2) Dabaga, Uzungwe Mtns. 28-31. xii. 29.

♂ ♂ 3 ♀ (M. C. Z. 148,953-7) Kigogo, Uzungwe Mtns. 21. i. 30.

Affinities. Selater may be correct in considering this form synonymous with *E. a. carendishi* Sharpe from Mapicuti, Cheringoma district, Mozambique but for the present we think it better to keep them distinct.

Enemies. These Nyasa Waxbills are trapped by the Wahehe in the Uzungwe Mountains who, after they have pulled out all the flight feathers, confine them in little reed cages where the majority die from the rough treatment to which they have been subjected. The natives informed me that they ate them as a savory with their porridge of corn meal.

GRANATINA IANTHINOASTER IANTHINOASTER (Reichenow)

Uraeginthus ianthinogaster Reichenow, 1879, Orn. Centralb., p. 114: Massa, Tana River, Kenya Colony.

♀ (M. C. Z. 148,958) Kikuyu, Ugogo. 23. xii. 29.

HYPOCHERA CHALYBEATA AMAUROPTERYX Sharpe

Hypochera amauropteryx Sharpe, 1890, Cat. Birds Brit. Mus., 13, p. 309: Rustenberg, Transvaal.

♂ (M. C. Z. 148,959) Mwaya, Lake Nyasa. 3. iii. 30.

HYPOCHERA FUNEREA FUNEREA Tarragon

Hypochera funerea Tarragon, 1847, Rev. Zoöl. Paris, p. 180: Natal.

♂ (M. C. Z. 148,960) Mwanza, Lake Victoria. 6. vi. 30.

♂ (M. C. Z. 148,961) Ukerewe Id., Lake Victoria. 11. vi. 30.

Native name. *Insimbi* (Kikerewe).

FRINGILLIDAE

SERINUS MOZAMBICUS MOZAMBICUS (Müller)

Fringilla mozambica P. L. S. Müller, 1776, Syst. Nat., Suppl., p. 163: Mozambique.

♀ (M. C. Z. 148,962) Tukuyu, Rungwe. 14. iii. 30.

Affinities. Kothe in 1911 recorded this bird from Tukuyu (=Neu Langenburg) under the name of *Serinus icterus madarazi*, a form described by Reichenow from Myombo, N. Nyasaland but considered by Sclater to be a synonym. Our material is insufficient to form the basis of an opinion but if *madarazi* be recognisable then Tukuyu birds should be assigned to that form.

SERINUS SULPHURATUS SHELLEYI Neumann

Serinus shelleyi Neumann, 1903, Orn. Monatsb., 11, p. 184: Kafuro, Bukoba Province, Tanganyika Territory.

♂ (M. C. Z. 148,963) Lukungu, Ubena Mtns. 8. ii. 30.

♂ ♀ (M. C. Z. 148,964-5) Tukuyu, Rungwe. 23. iv. 30.

Native names. *Suluwiri* (Kikinga); *isuluwiri* (Kinyakusa).

Affinities. Sclater, having examined the type of *S. frommi* from Namanyere, Ufipa considers it to be a synonym.

POLIOSPIZA WHYTHI (Shelley)

Serinus whythi Shelley, 1897, Ibis, p. 528, pl. xi: Nyika Plateau, Nyasaland.

♂ 3 ♀ (M. C. Z. 148,966-9) Kigogo, Uzungwe Mtns. 15-31. i. 30.

♀ (M. C. Z. 148,970) Tukuyu, Rungwe Mtn. 23. iv. 30.

♂ ♀ (M. C. Z. 148,971-2) Igale, Poroto Mtns. 28-30. iv. 30.

Birds from the last two localities are almost topotypic of this Yellow-browed Seed-eater.

POLIOSPIZA GULARIS REICHARDI Reichenow

Poliospiza reichardi Reichenow, 1882, Journ. f. Orn., p.209: Kakoma, Tabora District, Tanganyika Territory.

♀ (M. C. Z. 148,973) Kigogo, Uzungwe Mtns. 31. i. 30.

♂ (M. C. Z. 148,974) Igale, Poroto Mtns. 24. iv. 30.

Affinities. The localities in which the Nyasa Streaky-headed Seed-eater was obtained lie north and south of the Ukinga Mountains which is type locality for Reichenow's *Serinus melanochrous* which Sclater considers a synonym of *reichardi*.

Measurements. The wings of the male and female measure 81 and 83 mm. respectively.

LINURGUS KILIMENSIS RUNGWENSIS Bangs & Loveridge

Linurgus kilimensis rungwensis Bangs & Loveridge, 1931, Proc. New Eng. Zool. Club, 12, p. 96: Nkuka Forest, Rungwe Mtn., Tanganyika Territory.

4♂ (M. C. Z. 148,975-8) Nkuka Forest, Rungwe Mtn. 8-10. iv. 30.

♂ (M. C. Z. 148,979) Igale, Poroto Mtns. 29. iv. 30.

Native names. *Indalambwa* (Kinyakusa); *sogoseranandi* (Kinyika). The Kinyakusa name should be accepted with reserve as it may be the result of confusion with a golden weaver.

Habitat. These Oriole-finches were shot from the lower branches of trees in the big mahogany forest about a mile up the trail beyond the bridge which crosses the Nkuka River.

EXPLANATION OF PLATES

PLATE 1

PLATE 1

FIG. 1. TYPICAL BUSH FOREST OF THE UZUNGWE MOUNTAINS

This type of growth merges into the subtropical rain forest and is frequented by such genera as *Pseudoalcippe*, *Arizelocichla*, *Batis*, *Bessornis* and *Pogonocichla*. (Photo by Captain Wolfe.)

FIG. 2. GRASSLANDS OF THE UZUNGWE MOUNTAINS

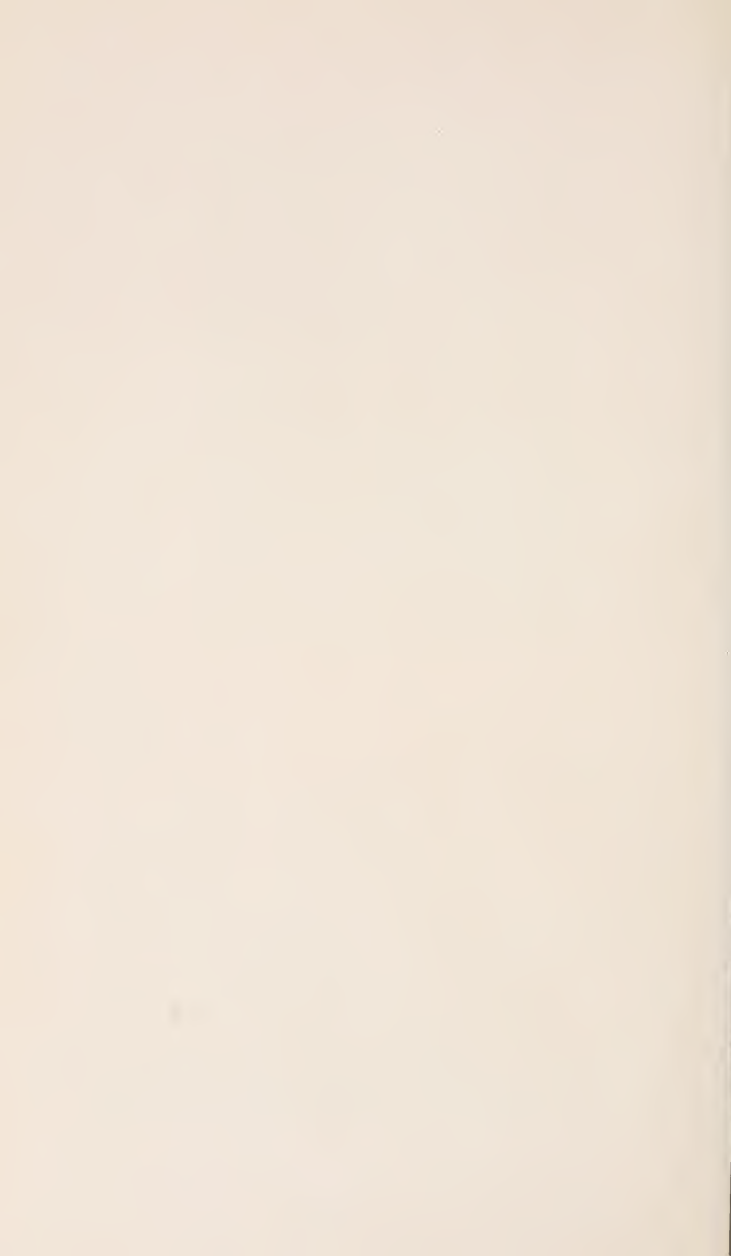
Typical also of much of the Ubena, Ukinga and Poroto ranges. It is the habitat of such birds as *Macronyx*, *Cisticola*, *Saxicola* and *Nectarinia*. (Photo by Captain Wolfe.)



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Bulletin of the Museum of Comparative Zoölogy

AT HARVARD COLLEGE

VOL. LXXV, No. 4

REPORTS ON THE SCIENTIFIC RESULTS OF AN
EXPEDITION TO THE SOUTHWESTERN HIGHLANDS
OF TANGANYIKA TERRITORY

IV

OLIGOCHAETA

BY J. STEPHENSON, D.Sc., F.R.S.

CAMBRIDGE, MASS., U. S. A.

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No. 4.— *Reports on the Scientific Results of an Expedition to the South-western Highlands of Tanganyika Territory*

IV

Oligochaeta

BY J. STEPHENSON, D.Sc., F.R.S.

The following pages contain an account of the Oligochaeta obtained by Mr. A. Loveridge on his recent expedition to Central Africa. The worms here mentioned were taken in Tanganyika Territory and at Albertville in the Belgian Congo.

The localities do not indicate any extension of the hitherto known range of the several genera, and the results are therefore not of very great zoo-geographical interest. But nearly all the forms obtained are new, and the investigation demonstrates how very far from complete our knowledge of the Oligochaeta of Central Africa still is; it is quite certain that rich harvests will be gathered in this region for very many years to come.

My thanks are due to Mr. Loveridge for kindly sending me his collection for examination, and to the authorities of the British Museum (Natural History) for the facilities which they have placed at my disposal. The types of the new species are deposited in the Museum of Comparative Zoölogy, Harvard.

Family MEGASCOLECIDAE

Subfamily Diplocardinae

Genus DICHOGASTER Beddard

DICHOGASTER FLAGELLIFERA sp. nov.

Albertville, Belgian Congo. 21.v.30. Four specimens, all with sexual marks.

External Characters. The largest specimen measures 92 mm., with 108 segments, a second 72 mm., with about 101 segments (not countable over part of the body), the shortest (also with sexual marks) 48 mm., with 105 segments; average diameter 3 mm., maximum 4 mm. Colour a darkish brown, the ventral surface slightly paler. No distinct secondary annulation.

Prostomium epilobous $\frac{1}{2}$, tongue small, with parallel sides; a transverse groove not at the hinder end of the tongue but a little way in front of this.

Dorsal pores from furrow 5/6.

The setae are closely paired; in the middle of the body and behind the clitellum $aa = 4-5ab = bc = 4-5cd$, while $dd = \text{ca. } \frac{2}{3}$ of the circumference; in the preclitellar segments aa is less,—distinctly less than bc , while $dd = \frac{3}{4}$ of the circumference, all the setal bundles being closer together on the ventral surface.

The clitellum covers segms. XIII-XX (= 8), and is saddle-shaped, or at least thinner and lighter in colour along a midventral strip.

The prostatic pores, on XVII and XIX, are in line with the ventral setae, possibly with b rather than with a . The seminal grooves are straight, and bounded by slightly swollen walls on each side.

The female pores were not seen.

The spermathecal apertures are two pairs, in furrows 7/8 and 8/9, rather close together, in line with setae ab .

Internal Anatomy. No septa are notably thickened,—12/13, 13/14 and 14/15 slightly so, and perhaps one or two more very slightly. The thin septum behind the pharyngeal mass is probably 4/5; 5/6 I think is represented by extremely delicate strands running obliquely forwards in front of the anterior spermatheca, and 6/7 by one or two strands in the ventral part of the body-cavity associated with blood-vessels which pass off the gut on to the body-wall; an extremely delicate septum, 7/8, envelopes the hinder gizzard; septum 8/9 is distinct, and 9/10 forms the anterior boundary of the testis sacs.

The gizzards, in VI and VII, are large, and separated only by a slight constriction. The calciferous glands occupy XV-XVII, the first two pairs opaque white, the last pair dull brown; there is not much difference in size,—in one specimen the last pair were rather smaller than the others, but in another specimen this was scarcely noticeable (the gland on the left side of XVII perhaps a little smaller).

The last hearts are in segm. XII. The micronephridia are distributed as a single row of not very minute organs (in each segment behind the clitellum), about a dozen on each side, smaller and less regularly arranged at the inner (lower) end of the row.

The testis sacs include the whole contents of segms. X and XI,—alimentary canal, dorsal vessel, hearts, seminal vesicles of XI, as well as the seminal funnels and much coagulum; the sacs appear in the dissection as a single opaque white mass, a membranous sac, divided internally into anterior and posterior portions by a partition (= septum 10/11), and projecting forwards some distance ventrally beneath and ventrolateral to the gut. The anterior wall of the sac represents

septum 9/10, the posterior wall 11/12; but there is no connection between the sac walls and the parietes ventrally or laterally. Testes were not seen,— they had probably dissolved into the mass of genital cells which filled out the sacs; the seminal funnels were however large and obvious.

The seminal vesicles are small, in segms. XI and XII; in one specimen they were lobed, those in XI indeed being divided down as far as their base; in the second dissected specimen the vesicles were almost smooth.

The prostates occupy parts of two segments, XVII and XVIII, or XIX and XX. Beginning in the anterior of the two segments, XVII or XIX, the gland pierces the septum, its larger portion then forming a

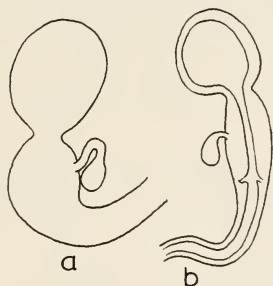


Fig. 1. *Dichogaster flagellifera*; a and b, spermathecae from different specimens.

loop with closely apposed limbs in the posterior of the two segments, XVIII or XX; passing forwards again and entering XVII (XIX) it becomes the duct, of some length, regularly or irregularly looped, thin and shining, the ental limb of the loop the thinner, the ectal limb being nearly twice as thick as the ental.

Ovaries and funnels are present in XIII; there is a small racemose ovisac on one side in XIV in the second dissected specimen.

The spermathecal ampulla (fig. 1) is sac-like, and constricted from the duct; this is longer than the ampulla, swollen in its ental half, which in some organs is almost as wide as the ampulla (fig. 1 a), narrower and tubular ectally and often somewhat curved; both the relative and absolute length of the duct vary. A comparison with other

forms suggests that the swollen part of the duct should more properly be considered as a middle section, a separate part of the apparatus, concerned in the production of spermatophores. The diverticulum is single, a small ovoid dependent chamber, attached by a stalk, which may be bent on itself, to the middle section of the apparatus not far below the ampulla.

The penial setae (fig. 2) are one per bundle, thin, the greater part of the shaft curved in the form of a gentle bow, a segment of a circle, and

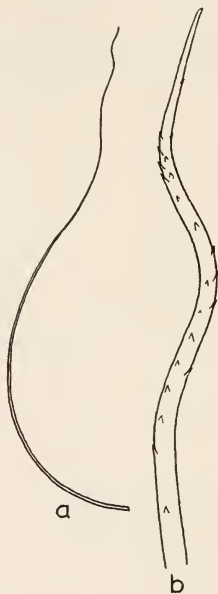


Fig. 2. *Dichogaster flagellifera*; penial seta. a, whole seta, $\times 25$; b, distal end, $\times 430$.

the distal end sinuous. In length they measure 3.3 mm., while the diameter at the middle of the shaft is only 10μ , towards the proximal end 18μ more or less, and towards the distal end 7μ ; hence the general

form is thread-like. The tip gradually tapers to a blunt point, the last 60μ being straight. The ornamentation consists of moderately large triangular teeth on the sinuous portion (about 0.25 mm.) near the distal end; these are somewhat irregularly distributed, yet with a tendency to a spiral arrangement; the terminal straight bit is almost free from the teeth.

Remarks. This species is rather like *D. aloysii sabaudiae* Cogn. ('09), especially in the spermathecae; that, however, is a much smaller worm, the testes and funnels are free, and though the penial setae have a faint resemblance, yet in reality they are quite distinct. *D. daemoniaca* Cogn. ('09) resembles the present form in the spermathecae, and also possesses testis sacs ('seminal pseudocapsules,' Cognetti, '09), though not quite of the same form (septa 9/10, 10/11 and 11/12 united peripherally at their insertion into the parietes); but the penial setae are distinctive.

The specific name *flagellifera* refers to the whip-like appearance of the penial setae.

DICHOGASTER ITOLIENSIS (Mich.) var. *minor* var. nov.

Benhamia itoliensis Mich. '92, Mitt. Mus. Hamburg, 9, ii, p. 31. Itoli, S.W. Victoria Nyanza.

see also

Dichogaster itoliensis Cogn. '09, Sped. Ruwenzori, 1, p. 360.

Kitungulu, Urungu, Tanganyika Territory (a little to the E. of the S. end of L. Tanganyika). 14.^v.30. Six specimens, two mature, larger than the rest but one incomplete behind (collector's note: "green rapidly soluble in alcohol").

External Characters. Length 132 mm.; diameter 4-5 mm. Colour (in the present condition) dark brown, somewhat lighter ventrally; the worms have apparently at some time, perhaps before preservation, become surface-dry and surface-hard,—hence probably the dark colour. Segments 147.

Prostomium indistinguishable in the present condition.

There is a distinct dorsal pore in furrow 5/6 in one specimen, and then apparently two smaller ones (in 6/7 and 7/8) which give vent to a slight oozing on squeezing the worm. Thereafter for several segments nothing in the shape of pores can be detected; but the condition of the specimens has to be remembered.

The setae are paired; in the middle of the body *aa* is rather greater than *bc*, but in front of the clitellum *aa* is approximately equal to *bc*; *dd* is about two-thirds of the circumference.

The clitellum is not developed. The prostatic pores, on XVII and XIX, are in line with the ventral setae, probably with *b*, each on a small papilla surrounded by a groove which is especially marked on the anterior and outer (in the anterior) or on the posterior and outer (in the posterior papillae) parts of their circumference. The seminal grooves are straight, without marked walls.

The female pores were not seen. The spermathecal apertures, inconspicuous, are in furrows 7/8 and 8/9, in line with setae *b*.

Internal Anatomy. Septum 4/5, behind the pharyngeal mass, is somewhat strengthened; 5/6 is represented only by one or two strands of connective tissue; 6/7, which should be attached between the two gizzards, is indistinguishable in this specimen; 7/8 is thin, 8/9 perhaps faintly strengthened, 9/10 and 10/11 slightly thickened, 11/12–13/14 moderately strengthened, 14/15 and 15/16 slightly so.

The gizzards occupy segms. VI and VII; the division between them is marked by the course of a transverse bloodvessel, and by a narrow softer annulus, but scarcely by a constriction; the anterior gizzard is rather longer than the posterior, while both are broader than long. The calciferous glands, in XV–XVII, increase somewhat in size backwards.

The last hearts are in XII. There are about a dozen micronephridia on each side in the postclitellar segments.

Testes and funnels, in an early stage, are free in X and XI. The seminal vesicles are very small (? in an early stage) in XI and XII. The prostates are not fully developed, but each appears to extend into two segments (XVII and XVIII, or XIX and XX). Ovaries are present in XIII.

The spermathecae (fig. 3) are in an early stage of development, but the three parts of the adult organ are distinguishable,—the rounded thin-walled ampulla, the thicker-walled intermediate portion, from which the multiple-chambered diverticulum is given off, and the immensely thick-walled duct.

The penial setae, 3.7 mm. long, 86μ in diameter at the middle, are fully grown, since they possess the short right-angled curve at the proximal end,—the last part of the seta to be formed. The thick straight cylindrical shaft with characteristic transverse striation, and the bluntly pointed lead-pencil-like tip are those of *D. itoliensis*.

Remarks. Cognetti ('09) united with Michaelsen's *D. itoliensis* the *Benhamia moorei* and *johnstoni* of Beddard ('01), and Michaelsen ('10) added to these also Beddard's *Benhamia mollis*. I have recently been through all the literature on these forms, and have examined Beddard's types and a considerable amount of other material in the British



Fig. 3. *Dichogaster itoliensis*; spermatheca of young sexual specimen.

Museum, including co-types of *Dichogaster jaculatrix* Baylis ('15), and other examples labelled *Dichogaster itoliensis*, *Dichogaster johnstoni*, as well as a number of specimens of large Central African worms awaiting identification. I hope to publish shortly at somewhat greater length some further details of this investigation; the result, shortly expressed, is that all the forms mentioned belong to a single rather variable species in which it is impossible to distinguish separate varieties or even 'forms.' The length, in specimens so far examined, varies between 205 and 560 mm. (592 mm. in life), the diameter between 7 and 20 mm., and the number of segments between 170 and 226. Though the present specimens are so very much smaller than the largest, or even than the average, of the species, I am not thoroughly convinced that I am right in separating them even as a variety; there may exist, and may later be found, examples which fill up the interval between the present specimens and the smallest (205 mm.) previously known. It may be that in this species growth in size continues till long after sexual maturity is reached, or even goes on throughout life, and that the very considerable differences in size represent merely differences in age. Testis sacs of the kind found in *D. itoliensis* were not noted in the specimen dissected; but it was in quite an early stage of sexual maturity, and just possibly the sacs might have developed later, though it is not very easy to understand how.

DICHOGASTER KIGOGOANA sp. nov.

Forest, Kigogo, Uzungwe Mts., Tanganyika Territory. 16.i.30. Two specimens, one in two pieces.

External Characters. Length 30 mm.; maximum diameter 3 mm. Colour brownish, rather lighter ventrally. Segments 91.

Prostomium (fig. 4) triangular, pointed behind, the point reaching to within a short distance of furrow $1/2$, and continued backwards to the furrow by a median groove. Furrow $1/2$ indistinct, almost obliterated.



Fig. 4. *Dichogaster kigogoana*; prostomium.

Dorsal pores begin in furrow $5/6$.

The setae are paired; $aa = bc$ mostly, but in front of the clitellum bc is greater; dd is equal to $\frac{2}{3}$ of the circumference.

The clitellum, saddle-shaped, extends over segms. XIII-XIX (= 7). The prostatic pores, on XVII and XIX, are in line with the ventral setae; the seminal grooves are straight, bordered by faint lips. The female and spermathecal apertures could not be distinguished.

Internal Anatomy. Septa 10/11-12/13 are somewhat thickened, 13/14 slightly so, the rest thin; 6/7 is present, but excessively tenuous, perhaps incomplete.

The gizzards, of some size, are in VI and VII. The calciferous glands, in XV-XVII, present no obvious differences in size. The last hearts are in XII.

Testes and funnels are free in X and XI. The seminal vesicles, in XI and XII, are large,—much larger than is usual in these Central African species of the genus; they are cauliflower-like, cut up into a large number of small lobules.

The prostates are tubular, rather small, apparently confined to one segment, not coiled. The duct is very thin, short, and of the same diameter throughout.

Ovaries and funnels are present in XIII, and ovisacs in XIV.

The spermathecae (fig. 5) consist each of three parts: (I) a sac-like thin-walled ampulla, separated by a constriction from (II) a middle portion, bulkier and more opaque than the ampulla and apparently with thicker walls, rounded, broader than long; (III) the duct, shining and muscular, as long as the middle portion, broadest above, narrowing gently towards its exit. The diverticulum is single, ovoid or almost spherical, shortly stalked, attached to the base of the middle portion and dependent by the side of the duct.

The penial setae (fig. 6) are one per bundle, 1.34 mm. long, and 15μ in diameter at the middle of the shaft. The shaft is very slightly bowed, the proximal end bent through the quadrant of a circle, somewhat like a hockey club; the tip is bluntly pointed and slightly hooked; there may be a few very faint undulations on the distal third or half of the shaft, which however may be almost indistinguishable.

The ornamentation consists of a few incisures — they can hardly be called teeth — on the terminal 0.25 mm. of the shaft, which cause a faint indentation of the margin of the shaft (the convex margin) as seen in profile.



Fig. 5. *Dichogaster kigogoana*; spermatheca.

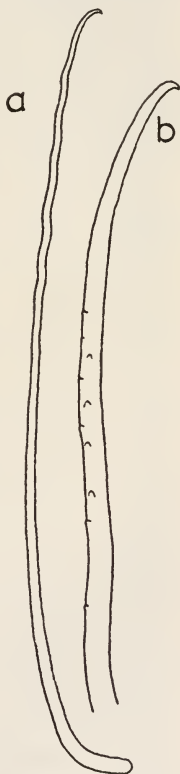


Fig. 6. *Dichogaster kigogoana*; penial seta. a, whole seta, $\times 95$; b, distal end, $\times 400$.

DICHOGASTER LOVERIDGEI sp. nov.

Kogogo, Uzungwe Mts., Tanganyika Territory. 18.i.30. Seven specimens, with two fragments, in bad condition.

Ihenye, Ukinga Mts., Tanganyika Territory. 8.ii.30. Several specimens and fragments, in bad condition.

External Characters. Length 71–87 mm.; maximum diameter 4 mm. Colour greyish or ochreous. Segms. 146, 148; preclitellar segments after the first few triannular.

Prostomium pro-epilobous, with a deep median groove prolonged backwards completely through segm. I.

Dorsal pores from furrow 5/6.

Setae closely paired, all ventral; in the middle and hinder regions *aa* is distinctly though not very much greater than *bc*, while in front of the clitellum $aa = bc$; $dd = \frac{2}{3}$ of the circumference.

The clitellum extends over the posterior third of XIII backwards to include two-thirds or the whole of XX ($= 7-7\frac{1}{3}$) it is thinner below, the ventral setae being visible, and the furrows; the furrows are obliterated above, but the dorsal pores are visible.

The prostatic pores are two pairs, on XVII and XIX, in line with setae *b*, on prominent spout-like porophores situated at the angles of a square or rectangle; the apertures have the form of lipped grooves which face the middle point of the square,—i.e. are subapically situated on (in the anterior pair) the inner and posterior or (posterior pair) inner and anterior aspect of the porophore. The included square is slightly depressed, flattened, and corrugated. The seminal grooves, bounded by slight lips, in their course on segm. XVIII are straight, along a line rather internal to that of the pores, and bend obliquely outwards at each end (i.e. on segms. XVII and XIX) to join the slit-like apertures on the porophores.

The female pores are in the setal zone of XIV internal to setae *a*.

The spermathecal apertures, inconspicuous, are in furrows 7/8 and 8/9, in line with the ventral setae.

Internal Anatomy. Septum 4/5 appears as a thin muscular sac or bag, closely investing the pharyngeal mass, from which it can be separated off; 5/6 appears to be absent; 6/7, between the gizzards, is represented only by a strand on the left side of the dissected specimen, and could not be distinguished at all on the right; 7/8 and 8/9, lying close together, are very thin; 9/10 is slightly thickened, 10/11–13/14 somewhat or moderately thickened, shining; the rest are thin.

The gizzards, in VI and VII, are of moderate size, rather rectangular, broader than long. The calciferous glands, in XV-XVII, show no great difference in size and none in colour or general appearance; those in XV are perhaps a little smaller, especially the one on the left side; in XVII a small separate lobe is seen depending from the hilus.

The last hearts are in XII. The micronephridia, not very small organs, are arranged in the segments behind the prostatic region as a row of about half a dozen on each side.

The testes and funnels are free in segms. X and XI. The seminal vesicles are two pairs, in XI and XII, those in XII rather the larger and lobed, those in XI smooth.



Fig. 7. *Dichogaster loveridgei*; spermatheca.

The prostates are tubular, each beginning in the same segment, XVII or XIX, in which it ends; after a short course it passes back into XVIII (XX), where it forms an irregularly convoluted mass, and again comes forward into XVII (XIX), ending abruptly by passing into the much narrower duct. The duct forms a loop with a short, very short, or almost non-existent narrow ental limb, the ectal limb being much longer, thicker, and more shining; the whole duct is however relatively rather short, and ends in close proximity to the stout muscular penial setal sac.

Ovaries and funnels are present in XIII, and rudimentary ovisacs in XIV.

The spermathecae (fig. 7) are of moderate size; the ampulla is smooth, subspherical, and constricted off from the middle portion, a soft sac of somewhat subspherical or irregular form, of approximately the same size as or rather broader than the ampulla; the middle portion

passes at its base into the short thick shining muscular duct. The diverticulum is single, pear-shaped (or ovoid and stalked), dependent, attached to the base of the middle portion, and bound down by connective tissue to the upper part of the duct.

A single stout penial seta (fig. 8) is contained in each setal sac; in length it is 2.24 mm., in diameter 53μ in the middle, 20μ near the tip.

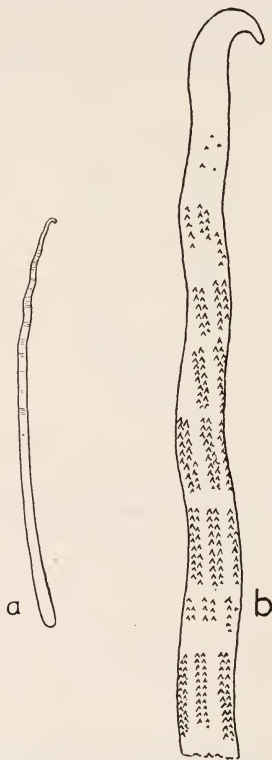


Fig. 8. *Dichogaster loveridgei*; penial seta. a, whole seta, $\times 46$; b, distal end, $\times 300$ (the ornamentation is not, as shown here, all in focus at once, since the groups of denticles are alternately on opposite sides of the shaft).

The shaft is slightly bowed, the distal two-fifths or so gently undulating,—about five faint undulations; the tip narrows to form a small hook. A few faint transverse striations, irregularly distributed, are seen in the substance of the shaft. In the concavities, apparently, of the undulations are four to six longitudinal rows, limited in extent and arranged more or less in pairs, of tiny sculpturings, resembling small teeth; sometimes the grouping is less regular. What appears as a convexity on one side of the shaft is a concavity on the other, and hence there are two series of such sculpturings, on opposite sides of the shaft, brought into view not all at once, but separately, by focussing at different levels. The ornamentation extends over the whole of the undulating part of the shaft; the more proximal groups of sculpturings are very distinct, the distal less so and smaller.

Remarks. The present species resembles *D. sellae* in some respects (Cognetti, '09); the groove leading backwards from the prostomium is rather reminiscent of that form, as also (in very general outline) are the penial setae and spermathecae. But in *D. sellae* $dd = \text{half the circumference}$, the undulations of the penial setae are closer together and the ornamentation sparser, and the spermathecal diverticulum may be many-chambered.

Perhaps a closer resemblance is furnished by *D. monticellii* (Cognetti, '14), where the ornamentation of the penial setae alternates, as here, on opposite sides; but the penial setae are not hooked, and the rows of denticles are not in pairs, and not so close together as here; and the middle portion of the spermatheca is not swollen (if indeed a middle portion can be distinguished in *D. monticellii*), but is of the same diameter as the duct.

DICHOGASTER RUNGWEENSIS sp. nov.

Nkuka Forest, Rungwe Mtn., Tanganyika Territory (to the N.E. of the N. end of Lake Nyasa). 17.iv.30. Two specimens, in bad condition.

Madehani, Ukinga Mts., Tanganyika Territory (at the N. end of Lake Nyasa): ii.30. Two specimens, in bad preservation.

External Characters. I regret that the condition of the specimens renders impossible anything more than a very cursory description of the external features. The longest specimen (which broke immediately into three pieces) measured 105 mm., but on account of the softening and consequent extension this is quite unreliable; another measured

90 mm. Diameter 3-4 mm. Colour purplish brown, cuticle iridescent. Segments?

The prostomium forms a considerable rounded lobe with a narrow triangular tongue, pointed backwards, the point just reaching furrow 1/2; a transverse furrow in front of the tongue (combined pro-epilobous and tanylobous).

The dorsal pores begin in furrow 5/6; in one of the examples from Madehani there was a rudimentary pore in 4/5.

The setae are paired; in front of the clitellum (where alone they can be distinguished) *aa* is usually equal to *bc*, occasionally slightly greater than *bc*; *dd* = about two-thirds of the circumference.

The clitellum, embracing XIII-XX (= 8), is ring-shaped on XIII-XVI, though thinner mid-ventrally, where it is paler and the ventral setae are visible; it is absent mid-ventrally and hence saddle-shaped, on XVII-XX.

The prostatic apertures, on XVII and XIX, are in line with the ventral setae, more exactly, perhaps, with *b*; the seminal grooves are very slightly bowed inwards, and are bordered by faint whitish lips; the male area, including the prostatic apertures and seminal grooves, has the form of a square.

The female pores were not visible.

The spermathecal apertures are small, in furrows 7/8 and 8/9, in line with setae *b*.

Internal Anatomy. Septum 4/5, behind the pharyngeal mass, is thin but quite obvious; 5/6 is very thin, perhaps incomplete, situated in front of the anterior gizzard; 6/7, between the two gizzards, is thin and probably incomplete, or even considerably reduced; 7/8 is more or less, 8/9-11/12 somewhat or moderately thickened, 12/13 slightly so.

The gizzards, in VI and VII, are well developed, cylindrical, the anterior being the larger,—both broader and longer. The calciferous glands, kidney-shaped, attached by the hilus, in XV-XVII, increase in size backwards, those in XV being the smallest, those in XVII the largest.

The last hearts are in XII. The micronephridia in the clitellar region are 9-10 on each side per segment (6 in a specimen from Madehani); behind the clitellum they are indistinguishable in these specimens.

The testes and funnels are free in X and XI. Seminal vesicles are present in XI and XII, those in XII of moderate size, with a granular surface but not divided into large lobes, those in XI rather smaller but similar in appearance.

The prostates are tubular, not very long, irregularly bent; the duct is relatively short, very narrow, irregularly bent, quite sharply limited from the glandular part.

The ovaries and funnels are in XIII, and ovisacs are present in XIV.

The spermathecae (fig. 9) are composed, as before, of three parts: (I) the ampulla, elongated, spindle-shaped, joined by a rather narrow neck to the next, or (II) middle portion, opaquely white like the ampulla, widening gradually towards its base; (III) the duct, shining,

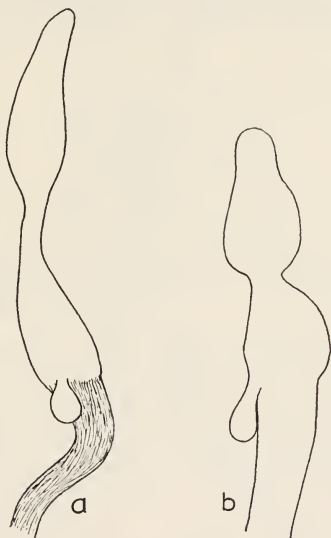


Fig. 9. *Dichogaster rungweensis*; a and b, spermathecae of two different specimens.

muscular, as broad as the middle portion at its upper end, but narrowing somewhat as it passes towards the body-wall. The diverticulum is small, ovoid, shortly stalked, glistening, and dependent, and is attached to the middle portion at its lower end, where this merges into the duct. In a specimen from Madehani the spermathecae were shorter and relatively thicker, as if contracted (fig. 9 b).

One fully grown and one incompletely developed penial seta are found in each bundle (fig. 10). In length a seta is about 1.8 mm., in diameter 20μ at the middle of the shaft, 28μ near the base, 16μ shortly before the tip. The shaft is slightly bowed, uneven in outline, in part

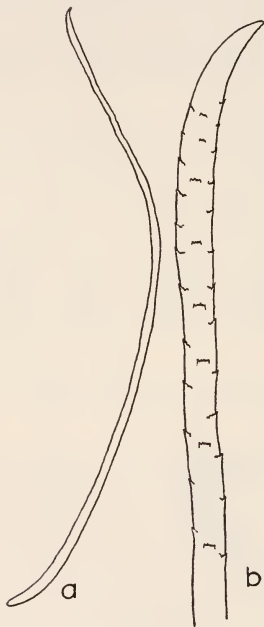


Fig. 10. *Dichogaster rungweensis*; penial seta. a, whole seta, $\times 58$; b, distal end, $\times 400$.

sinuous, in part gently swollen and contracted alternately, somewhat like the ventral nerve cord as seen in dissection, but less regular. The tip is slightly curved, and tapers to a blunt point; the distal fourth or so (0.4–0.5 mm.) is ornamented by a number of teeth, which may be described as broad jagged notches, irregularly situated, hardly standing

off at all from the surface. The seta may be slightly thicker near the tip than further up the shaft (as in fig. 10 b). In the specimens from Madehani these setae were slightly longer (1.9–2 mm.) and thicker (25μ at the middle, 33μ near the base, 17μ near the tip).

Remarks. The shape of the spermathecae is very strongly reminiscent of *D. mundamensis*, which however is a much smaller worm (length 40 mm., diameter 2 mm.), and differs in numerous other particulars,—e.g. the penial setae are hooked at the end, the distal portion tapers much more, and the character of the ornamentation is different.

Family EUDRILIDAE

Subfamily Eudrilinae

Genus POLYTOREUTUS Mich.

POLYTOREUTUS STRIATUS sp. nov.

Madehani, Ukinga Mts., Tanganyika Territory (at the N. end of Lake Nyasa).

ii.30. A single specimen, in two pieces, in bad condition (along with specimens of *Dichogaster runweensis*).

External Characters. Length 115 mm. (softened); maximum diameter 4 mm. Colour purple dorsally, with a banded appearance behind the clitellum (hence the specific name), due to the intersegmental furrows being pale, and also to a series of transverse pale bands across the dorsum at the middle of each segment; ventrally the worms are pale, the passage from purple to pale at the sides being rather sudden. Segments ca. 195.

Prostomium prolobous.

Dorsal pores absent.

The setae are paired, the ventral widely, the lateral more closely (the setae can only be seen in front of the clitellum); aa is rather less than $2ab$, and is equal to bc ; $cd = ca. \frac{1}{2}ab \cong ca. \frac{1}{3}bc$, but the ratios vary somewhat; dd is scarcely as much as half the circumference.

The clitellum includes $\frac{2}{3}$ of segm. XIII in front and the whole of XVII behind; it is rather lighter in colour than the surrounding regions, not swollen, and the grooves are not completely obliterated. The huge genital field takes up much of the clitellar region on the ventral surface, so that it is difficult to say if it is saddle-shaped.

The genital field (fig. 11) may be described as roughly triangular, with truncated apex (anterior end) and much rounded angles. The area includes (I) a lip, thick in front and behind, narrow at the sides; (II) three oval papillae, one smaller, median and anterior, within the curve of the lip, the flat surface of the papilla sloping backwards, and

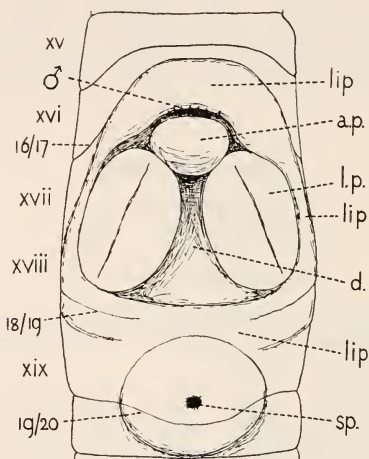


Fig. 11. *Polytoreutus striatus*; genital field. *a.p.*, anterior papilla; *d.*, median depression; *lip*, lip surrounding papillae; *l.p.*, lateral papillae; *sp.*, spermathecal aperture with surrounding lip; ♂, position of male aperture.

two very large, lateral, their long axes directed forwards and slightly inwards, and their sharply cut margin bounded by a narrow groove on the outer side where the papilla is closely adjacent to the lip, and by a very deep groove on its inner side; their surfaces flat, and marked, rather external to their long axes, by a long, straight, narrow but quite shallow furrow; (III) a median depression, bounded by the two large papillae at the sides, the small anterior papilla in front, and the posterior lip behind; owing to the disposition of the large papillae this depression is broader behind than in front. Furrow 16/17 seems to bend forwards strongly and to pass in front of the lip, which overhangs it;

furrow 18/19 passes on the posterior lip, the hinder border of which is not well defined, and melts away in the mid-ventral region.

The male aperture is median, a slit between the anterior lip in front and the anterior of the three papillae behind; from the course of furrow 16/17 this would correspond to a position on segm. XVII.

The female apertures are not visible externally, but from dissection appear to be laterally situated on segm. XIV.

The spermathecal aperture is single, behind the genital field, moderately conspicuous, surrounded by a broad lip which is more prominent behind the aperture than in front of it; the whole transversely oval in shape, taking up more than half the width of the ventral surface, extending backwards over the whole of XX, while in front the lip of the spermathecal aperture melts into the lip bounding the genital area behind. On careful examination furrow 19/20 can be faintly seen, passing a little way behind the spermathecal aperture, across its posterior lip; the aperture is therefore on the hinder part of segm. XIX.

Internal Anatomy. Septum 4/5 is very thin, but apparently complete; 5/6 is thin; 6/7 shows a commencing thickening, 7/8 is somewhat and 8/9-10/11 moderately thickened, 11/12 slightly so, and the rest thin.

The gizzard, in segm. V, is firm and of some size, broad anteriorly, narrowing backwards. The calciferous glands are unpaired and ventrally situated in IX-XI, of moderate size, attached to the gut by a short narrow stalk, and paired in XIII, fairly bulky, attached by a broad base, not stalked.

The last hearts are in XI.

The worm is metandric; a pair of testis sacs are present in XI, rather small, sessile on septum 11/12. From each sac emerges in segm. XI a sperm reservoir, a looped or slightly convoluted tube, shining because of the contained spermatozoa, the second (or ectal) limb of the loop thicker than the first (or ental). Penetrating septum 11/12, the reservoir becomes the vas deferens, a straight tube which passes backwards by the side of the ventral nerve cord.

Leaving the testis sac, another tube, long, straight, narrow and semi-transparent, passes backwards from the hinder aspect of septum 11/12, side by side with its fellow, on the dorsal side of the gut; this is the seminal vesicle, which when it reaches segm. XXVII begins to swell out segmentally,—slightly in XXVII and XXVIII, more considerably in XXIX-XXXII, where it ends; these swollen portions of the vesicles are also on the dorsal side of the gut.

The prostates (fig. 12) are paired, the right (in this specimen at least) bent into a loop directed forwards and extending as far as segm. XIV, the left straight and stretching backwards to XXV; each is

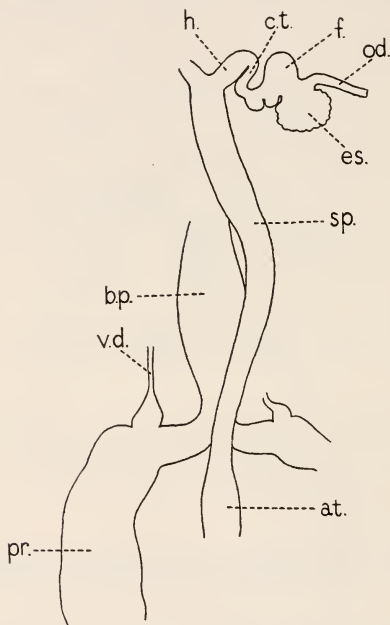


Fig. 12. *Polytoireutus striatus*; female organs, median and of right side, with part of the prostates. *at.*, terminal slight dilatation of spermatheca (= atrium); *b.p.*, bursa propulsoria; *ct.*, connecting tube; *es.*, egg-sac; *f.*, enclosed funnel; *h.*, anterior horn of spermatheca; *od.*, oviduct; *pr.*, prostate of left side; *sp.*, spermathecal tube; *v.d.*, vas deferens.

cylindrical, slightly shining, rather soft, and faintly constricted at the sites of the septa. The vas deferens joins a teat-like papilla situated near the ectal end of the gland, just before it narrows and turns inwards

to join its fellow in the middle line, beneath the nerve cord in XVIII. The single tube, narrow at its commencement, then passes forwards, swells out again to form a considerable ovoid longitudinally placed sac (bursa propulsoria) and finally again contracting somewhat, pierces the body-wall on a level with the nephridia of XVI (which corresponds to segm. XVII externally,— cf. fig. 11).

The spermatheca (fig. 12) is a median, shining, fairly regularly cylindrical tube, single throughout practically the whole of its extent (nearly as far as its anterior end), which passes forwards from its junction with the body-wall in XIX, over the place of junction of the two prostates, by the right side of the prostatic bursa to segm. XIV. It is faintly dilated at its posterior end, where it joins the body-wall, and its anterior half again is rather wider than the part behind this. There are no diverticula. At its anterior end the tube bifurcates to form two short horns, also shining; each horn is continued outwards by the connecting tube to the enclosed funnel, a swollen region, with which communicate a moderate-sized rounded mammillated egg-sac, and a multiple sperm-magazine which is hardly recognizable except in sections. The oviduct, a short straight tube directed outwards, places the enclosed funnel in communication with the exterior.

The horns of the spermatheca and all the organs subsequently described are situated in segm. XIV; none have any connection with the thin septum 13/14, and no genital organs are visible in XIII; ovaries and ovarian sacs have disappeared in the present specimen.

A few additional particulars can be gathered from the examination of sections (fig. 13): — The connecting tube, into which the horn of the spermatheca is continued, is narrow and bent, thick-walled, muscular, and lined with columnar epithelium. The enclosed funnel is an irregular cavity with a thick wall of (muscle and ?) connective tissue cells and fibres, lined by elongated columnar cells. The egg-sac is attached to the posterior aspect of the enclosed funnel by a broad base, and is thus shaped somewhat like a mushroom with a broad very short stalk; the mammillations of the surface correspond to egg-follicles; the ova are, if large, one or two in a follicle, but masses of smaller ova may occur, or one medium-sized ovum may occupy a follicle along with a number of small ova; the cavity in the base and stalk of the sac communicates widely with that of the enclosed funnel.

The sperm-magazine consists of about half a dozen small loculi, each somewhat pear-shaped, arranged side by side, their mouths (the narrow ends of the pears) converging somewhat to open into the base

of the enclosed funnel (or beginning of the oviduct) close against the stalk of the ovisac.

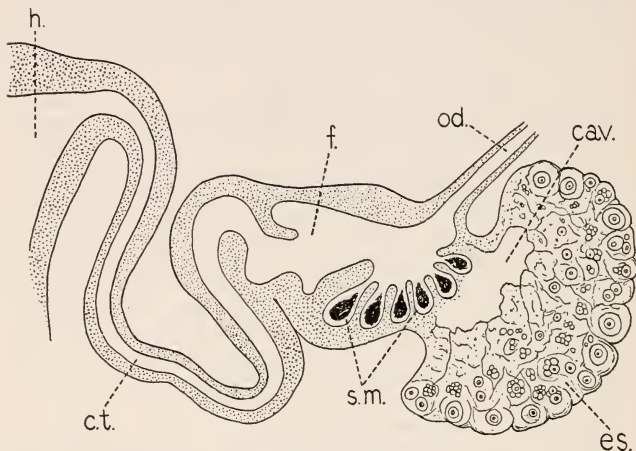


Fig. 13. *Polytoreutus striatus*; female organs of the right side, diagrammatic, constructed from a series of sections; the opening from the cavity of the egg-sac into the base of the enclosed funnel is at a different (lower) level from the openings of the chambers of the sperm-magazine. *cav.*, cavity of egg-sac; *c.t.*, connecting tube; *es.*, egg-sac; *f.*, enclosed funnel; *h.*, horn of spermatheca; *od.*, oviduct; *s.m.*, chambers of the sperm-magazine.

The oviduct is narrow and thin-walled, and leaves the anterior aspect of the sperm-magazine.

Family GLOSSOSCOLECIDAE

Subfamily Microchaetinae

Genus ALMA Grube

ALMA EMINI (Mich.) f. *typica*

Siphonogaster emini Michaelsen '92, Mitt. Mus. Hamburg, 9, ii, p. 36, Taf. fig. 4, 5. Bukoba, Tanganyika Territory.

see also

Alma emini Michaelsen '15, Ergeb. 2. Deutsch. Zent.-Afr.-Exp. 1910-11. 1, Teil i, p. 296.

Albertville, Belgian Congo. 21.v.30. A single specimen, not fully mature.

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M.C.C.-C.

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AT HARVARD COLLEGE
VOL. LXXV, No. 5

**REPORTS ON THE SCIENTIFIC RESULTS OF AN
EXPEDITION TO THE SOUTHWESTERN HIGHLANDS
OF TANGANYIKA TERRITORY**

V

CRABS

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BY MARY J. RATHBUN

WITH SEVEN PLATES

CAMBRIDGE, MASS., U. S. A.
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No. 5.—*Reports on the Scientific Results of an Expedition to
the Southwestern Highlands of Tanganyika Territory*

V

Crabs

BY MARY J. RATHBUN

The fresh-water crabs collected by Mr. A. Loveridge during his recent expedition number eight species of *Potamon* and one of *Deckenia*. Only one *Potamon*, *P. bottegoi*, has a lateral spine or tooth on the carapace. In the remainder the postfrontal crest forms an obtuse angle with the lateral margin behind the crest. Some species have a deep hollow between the orbit and the crest; the most striking is *loveridgei*, a large strongly convex species; near it there is a small form with hollow less deep; it belongs to the subgenus *Geothelphusa* on account of the crest bluntly rounded except at the ends. Also closely allied is the species *reichardi* of moderate size, with the carapace not so convex nor so deeply hollowed behind the orbit. In *johnstoni unisulcatus* the carapace is much swollen, the ischial furrow absent from the maxilliped or only faintly marked. The identity of *P. suprasulcatus* with the true *hilgendorfi* has been proven.

The well-known shore species, *Ocypode kuhlii*, is included for figuring.

POTAMONIDAE

POTAMON (POTAMONAUTES) LOVERIDGEI spec. nov.

Plate 1; Plate 2, Figure 1

10 ♂ 14 ♀ (M.C.Z. 7676) Luiche River, Ujiji. 24.V.30.

1 ♂ (M.C.Z. 8022) Dabaga, Uzungwe Mtns. i.I.30.

This belongs to Group A of the subgenus *Potamonautes*¹ in which there is no tooth on the lateral border of the carapace behind the orbital tooth. Carapace about two-thirds as long as broad, very con-

¹Nouv. Arch. Mus. Hist. Nat., Paris, 1905, 7, p. 162.

vex longitudinally, less so transversely, being rather flat in the middle third. Branchial regions much swollen but not expanded laterally as far as the orbit is wide, in either old or young. Grooves deep about the urogastric area and the front and sides of the cardiac region; narrow part of mesogastric region well defined, roof-shaped, a deep median groove extends from it half way down the front. Anterior part of cervical suture feeble. Surface smooth to the naked eye, covered with a fine depressed granulation with larger distant punctae interspersed. A few short, faint striae on the antero-lateral surface. Postfrontal crest transverse except near the middle, the epigastric lobes, where it is slightly advanced and thicker and blunter; the outer ends join the lateral margins of the carapace at an obtuse angle and without forming a tooth. In strictly dorsal view the crest stands over and conceals the middle border of the orbit; in front view it is strongly arched, each half curved down a little toward the median line. Behind the crest the lateral margin is marked for half its length by a narrow smooth raised line with a row of punctae through its middle; near the crest the margin is compressed and outstanding but posteriorly it becomes gradually lower until it fades away on the postlateral border. Anterior margin of front invisible in dorsal view; its width is twice as great as the median height of the front; it is arcuate and forms an angle of about 45° with the lateral margin; frontal margin formed of a prominent smooth rim which widens a little just below the attachment of the eye-stalk. Orbit narrowing from the inner to the outer end, the upper margin very oblique, the lower transverse; the orbit is pinched in at the middle opposite the compression of the eyestalk, its upper margin slenderer than the frontal margin, and its lower margin slenderer than the upper. Some specimens, however, have the lower margin not sinuous or bent upward at the middle, but forming a regular downward curve from end to end. The outer third of the postfrontal crest is in front view subparallel to the upper orbital crest, although these crests are further apart at the outer than the inner ends; the interspace is deeply hollowed out in a gutter, the deepest spot close to the sinus of the upper orbital margin; the outer end terminates in a broad V-sinus, the point of the V being immediately behind the suborbito-branchial sinus. This sinus is bordered by a line of granulo-crenulations directed forward; the anterior part of the pterygostomial ridge by a line of separated granules.

The groove on the ischiūm of the outer maxilliped is deep and terminates short of the distal end of the article. Anterior end of male sternum rather narrow; anterior groove deep and transverse; second

groove broadly V-shaped, shallow at middle, deep at either end. In front of the abdominal cavity there is a smooth, glossy, raised, arched area subparallel to the terminus of the telson and extending some distance beyond.

Chelipeds very unequal in ♂, less so in ♀; surface coarsely punctate; margin of merus armed with appressed spines above, blunt outstanding teeth below, and small triangular teeth or coarse denticles on the inner edge, with also a large conical spine near distal end; a moderate spine at inner angle of carpus, a smaller one beneath; palms unequal in both sexes, the major one swollen and in ♂ higher than superior length; palms rough above; fingers long, rather slender, narrowly gaping, multidentate with a few larger teeth on each finger. Legs stout, merus of second pair about three times as long as broad.

Abdomen of male with the sides slightly concave from middle of third to middle of sixth segment. There is considerable variation in the width especially of the sixth segment; in two specimens of equal size this segment has the same length, 7.2 mm.; the width in the type-specimen is 9 at the small end, 10.8 at the union with the fifth segment; in the other specimen these widths are respectively 9.8 and 11.4 mm.

In general appearance this species suggests a relationship to *P. (Potamonautes) floweri*,¹ which however is much wider, with a tooth behind the orbit, a postfrontal crest strongly advanced at the extremities, a bilobed front, a single horizontal sternal groove.

Measurements. The males vary in width from 31.4 to 48.4 mm., the females from 35 to 52 mm.

Measurements of type specimen:

Length of carapace 33.6

Width of carapace 48.4

Width at postfrontal crest 37.1

Fronto-orbital width 33.1

Width of lower edge of front 12.6

Width of upper line of front 18.5

Height of front to postfrontal crest 6.1.

The small male from Dabaga is 14.3 x 20.1 mm. In the main it agrees with the specimens of the type lot, all of which are much larger; the margin of the front is less arcuate and at the middle bends backward; the color after preservation in alcohol is a deep red.

¹ De Man, 1901, Proc. Zool. Soc. London, p. 94, pl. X; Rathbun, 1921, Bull. Amer. Mus. Nat. Hist., 43, p. 406, text-fig. 6, pl. XX, fig. 2.

POTAMON (POTAMONAUTES) REICHARDI (Hilgendorf)

Plate 3; Plate 4, Figures 3 and 4

Telphusa reichardi Hilgendorf, 1898, Deutsch-Ost-Afrika 4, p. 13: German East Africa.

Potamon reichardi de Man, 1898, Ann. Mus. Civ. Stor. Nat. Genova (2) 19, p. 438 [57].

2 ♀ (M.C.Z. 8023) Madehani, Ukinga Mtns. II.30.

7 ♂ 14 ♀ (M.C.Z. 7677) Nkuka Forest, Rungwe Mtn. 24.III.30.

A small species related to *P. (Potamonautes) loveridgei*. Compared with a specimen of the latter, also male, of subequal size, about 31 mm. wide, the following differences appear: Body less thick — 12.8 against 15.6 mm. in *loveridgei*. Carapace less swollen, anterior margin of front visible in dorsal view. The anterior part of the mesogastric region is narrower and but very slightly constricted, then widening a little with sides angular and gradually narrowing to a point near the postfrontal crest; the median furrow reaches half way down the front. The surface of the carapace has a different aspect owing to a fine wrinkling added to the flat granular pavement and the punctae, which are more numerous than in the larger species. Postfrontal crest though advanced at middle not thicker there than elsewhere; it is directed slightly forward at the outer end, but not nearly so much downward; it does not conceal nor reach so far forward as the line of the orbits; it is feebly crenulate the crenules most evident at the outer fifth. In those carapaces about 23 mm. and less in width the crest more often does not bend forward at outer end. The lateral margin is broken into smooth oblong tubercles, the first few behind the crest somewhat dentiform, the posterior ones gradually smaller. Margin in front of crest not V-shape, but forming a broad U. Front less high than in *loveridgei*, anterior margin wider, slightly bilobed and nearly three times as wide as the median height of the front; sides of front more longitudinal than in the allied form. Lower margin of orbit not sinuous, more prominent, and with a narrower, deeper outer sinus.

Groove on ischium of outer maxilliped extraordinarily deep. Upper surface of carpus and manus of cheliped less rough, fingers stouter, meeting without gape. Ambulatory legs shorter and narrower. The posterior of the two sternal grooves is developed only at the extremities and there faintly. The anterior end of the abdominal cavity is bordered by a narrow ridge; no trace of a glossy raised area further forward

on the sternum as in *loveridgei*. Sides of male abdomen nearly straight, sixth segment slightly constricted near distal end. In small males the terminal segment projects laterally a little beyond the adjoining end of the sixth segment.

Measurements of largest male.

Length of carapace 22.4 mm.

Width of carapace 31.2

Width at postfrontal crest 24.6

Fronto-orbital width 20.9

Width at lower edge of front 8.4

Width at upper line of front 11.1

Height of front to middle of postfrontal crest 3.

POTAMON (POTAMONAUTES) JOHNSTONI UNISULCATUS subsp. nov.

Plate 2, Figures 2-4

5♂ 4♀ (2 ovig.) 3 broken (M.C.Z. 7678) Bagilo, Uluguru Mtns. IX.26.

Type lot.

3♀ (1 ovig.) (M.C.Z. 7679) Nyange, Uluguru Mtns. 9.X.26.

Differs as follows from typical *johnstoni*:¹ the largest specimen (Bagilo) (♀) 35 x 52 mm. resembles Calman's fig. 11 in the crest being well marked but differs in the forward curvature of the outer extremities. The toothing of the anterior margin of the arm is the same as in the figure. In small specimens the two halves of the postfrontal crest may be straight or nearly so and slope slightly backward from the median line. In the larger specimens, 32 to 52 mm. wide, the swollen condition of the antero-lateral region has driven the outer portion of the crest forward, so that the two halves of the crest are concave forward and not as a whole inclined backward from the middle. The male abdomen does not have straight sides as in Calman's fig. 10, but the margin of the 4th-6th segments is concave. The males, 32 mm. and less in width, lack the posterior of the two sternal grooves figured by Colosi (fig. 15a), there being only very faint indications of the same.²

¹ See Calman, 1909, Trans. Zoöl. Soc. London, 19, pt. 1, p. 51, text-figs. 9-12.

² Ark. f. Zoöl., Stockholm, 1924, 16, p. 21.

POTAMON (POTAMONAUTES) HILGENDORFI (Pfeffer)

Telphusa hilgendorfi Pfeffer, 1889, Jahrb. Hamburg. Wiss. Anst., (2) 6, 1888, p. 32: On the way to Kilimanjaro.

Telphusa suprasulcata Hilgendorf, 1898, Deutsch-Ost-Afrika, 4, p. 8, pl., fig. 5-5d: German East Africa.

Potamon suprasulcatum de Man, 1898, Ann. Mus. Civ. Stor. Nat. Genova (2) 19, p. 438 [57].

Potamon (Potamonautes) hilgendorfi de Man, 1901, Proc. Zoöl. Soc. London, p. 102; not *Telphusa hilgendorfi* Hilgendorf, 1898, Deutsch-Ost-Afrika, 4, p. 9, fig. 3.

2♂ 4♀ 2 broken (M.C.Z. 7682) Amani, Usambara Mtns. XII.26.

1♂ (M.C.Z. 7683) Mkarazi, Uluguru Mtns. 21.X.26.

1♀ ovig. (M.C.Z. 8024) Kigogo, Uzungwe Mtns. 13.II.30.

Dr. Panning has kindly sent me for study all the specimens of *P. hilgendorfi* remaining in the Hamburg Museum. They correspond to those described and keyed by Hilgendorf as *Telphusa suprasulcata* (1898, pp. 7-9): Carapace moderately swollen; postfrontal crest sharp-edged; carpal tooth conical; side wall three-parted; mesogastric furrow slit-form; furrow lacking on outer maxilliped and present on fixed finger; anterior branch of cervical furrow present.

Measurements.

	♀, Amani	♂, Amani	♂ Mkarazi
Greatest width of carapace.....	72.6	62.2	29.1
Length of carapace.....	51.2	40.2	21.3
Distance between extraorbital angles.....	41.6	37	20.6
Breadth of anterior frontal margin	19.2	16.1	9.8
Breadth of orbits.....	12	10.2	6

A small ♂ specimen, M.C.Z. 8025, Madehani, Ukinga Mountains, II.30., 11.5 x 15.3 mm., may be a variety of *hilgendorfi*. It differs from the larger specimens of that species as follows: The lateral regions of the carapace are rougher, the crenulated carinae more numerous; this may be an age variation. The postfrontal crest is straighter and more oblique; as in the old specimens it joins the lateral margin without a semblance of a tooth. The upper margin of the orbit is regularly concave, not bent downward or forward at the middle.

POTAMON (POTAMONAUTES) USAMBARAE nom. nov.

Plate 6

Telphusa hilgendorfi Hilgendorf, 1898, Deutsch-Ost-Afrika, 4, p. 9, fig. 3;
not *T. hilgendorfi* Pfeffer 1889.

2 ♂ 2 ♀ (M.C.Z. 7680) Amani, Usambara Mtns. XII.26.

1 ♂ 1 ♀ ovig. (M.C.Z. 7681) Kizerui, Usambara Mtns. 8.XII.26.

A large species, 59 mm. broad (Hilgendorf). The small specimens in hand appear to belong here, although the sinus below the outer angle of the orbit is shallow, not deep as described for the large specimen.

Carapace rather flat behind, inclined downward anteriorly, edge of front not visible in dorsal view. Surface microscopically granulate and finely wrinkled, punctate, a few very faint oblique striae on the anterolateral region. Cardiac furrows and middle portion of cervical suture distinct, lateral branches lacking. Postfrontal crest well marked, acute, punctate, transverse in dorsal view except at extremities which are directed a little forward and downward, forming an obtuse angle without tooth; in front view the two halves are separately convex. Median mesogastric furrow broad, continued halfway down the front. Upper margin of orbit trending obliquely forward, downward and outward, slightly sinuous; lower margin arcuate; both margins turn forward at outer end to tip of outer tooth, rectangular in dorsal view. Lateral expansion of carapace a little greater than width of orbit; margin finely denticulate, ending in front of the gastro-cardiac line. Subbranchiohepatic furrow nearly obsolete but marked by a row of minute granules; pterygostomial furrow more distinctly granulate. Furrow on ischium of outer maxilliped deep, not continued to either end. Anterior sternal furrow in male continuous, wider and deeper at the extremities; posterior furrow incomplete, developed at outer ends, inner half obsolete. Sternum swollen along insertion of the cheliped. Abdomen (♂) triangular, sides slightly concave from third to sixth segment. Merus of chelipeds with outer and upper surface rough with short granulate rugae; inner and outer margins denticulate, a longish spine near distal end of inner margin. Inner spines of carpus well-developed, conical. Surface of wrist and palm rough with scabrous granules. Chelae in both sexes unequal, swollen, in major chela narrowly gaping, fingers very rough. Merus of ambulatory legs expanded at middle.

Measurements.

	♂, Amani	♀, Kizerui
Length of carapace.....	16.8	18.2
Width of carapace.....	22.6	26.3
Width at postfrontal crest.....	18	20.4
Fronto-orbital width.....	16	17.2
Width of lower edge of front.....	6.2	6.4
Width of upper line of front.....	8	8.4
Height of front to postfrontal crest.....	2.3	2.8

POTAMON (POTAMONAUTES) BOTTEGOI de Man

Potamon (Potamonautes) bottegoi de Man, 1898, Ann. Mus. Civ. Genova, (2) 19, p. 262 [3], pl. III: Somaliland.

1 ♂ (M.C.Z. 7684). Miritini, Kenya Colony. 30.X.29.

POTAMON (ACANTHOTHELPHUSA) NILOTICUS (Milne Edwards)

Thelphusa nilotica Milne Edwards, 1837, Hist. Nat. Crust., 2, p. 12.

Thelphusa nilotica Milne Edwards, 1854, Arch. Mus. Nat. Hist. Paris, 7, p. 170, pl. xii, fig. 2.

Potamon (Acanthothelphusa) nilotica Ortmann, 1897, 10, p. 300.

1 ♂ 5 ♀ (M.C.Z. 8026). Entebbe, Uganda. 27.VI.30.

POTAMON (GEOTHELPHUSA) EMINI (Hilgendorf) var. Bouvier

Plate 4, Figures 1 and 2; Plate 5

Potamon (Geothelphusa) emini (Hilgendorf) Bouvier, 1921, Voy. Alluaud et Jeannel en Afr. Orient., Crust., 3, p. 50 (part: specimens from Kijabé, text-fig. 4).

1 ♂ 1 ♀ paper shell, 2 ♀ (one bearing young, the other eggs) (M.C.Z. 7685). Kigogo River, Uzungwe Mtns. 25.I.30.

A small form, the largest specimen 20 mm. wide, length $3/4$ of width. Surface smooth to naked eye, paved with very fine granulation, mixed with scattered punctae; on the postlateral region a patch of larger punctae closer together; horizontal striae and punctae cover the intestinal region; no antero-lateral striae. Gastro-cardiac furrow broad and deep; at either end a short curved furrow, the posterior end of which forms a hook on the branchial region; in front of this two or three small round dimples; a shallow elongate depression indicates the

middle of each branch of the cervical suture. Antero-lateral border narrow, raised, entire, ending at a point in line with the gastro-cardiac furrow. Front bilobed; anterior width less than $1/3$, posterior width about $2/5$, of width of carapace. Outer orbital tooth short, thick, rectangular; orbital margin regularly curved, coarsely punctate; upper margin more deeply cut than lower and inclined downward toward the outer end. Postorbital ridge resolvable into low epigastric lobes, separated by an obscure median furrow and faintly so from the smooth protogastric portion; outer portion of crest beginning behind the middle of the eyestalk strongly carinated and curved downward parallel to the orbital border and separated from it by a deep gutter. The antero-lateral margin of the carapace in front of the crest forms a very broad V, the anterior end thickened. Hepatico-branchial boundary finely granulate; anterior end of pterygostomial region granulate. Ischium of external maxilliped deeply grooved.

Chelipeds unequal in both sexes, coarsely punctate; proximal spine on inner edge of merus very short, subdentiform; major manus swollen; fingers narrow, grooved. Ambulatory legs rather slender.

Sternal groove between maxillipeds deep; that between chelipeds is angular, almost obsolete in middle, laterally broad and deep, stopping short of the lateral margin of the sternum. A narrow rim around end of abdominal cavity, extends a little beyond the abdomen itself.

Male abdomen oblong-triangular, sides nearly straight, of sixth segment slightly convex, of seventh sinuous, this segment extending laterally slightly beyond the adjoining end of the sixth.

Measurements.

	♂	♀
Length of carapace.....	10.2	14.8
Width of carapace.....	14.2	20
Width at postfrontal crest.....	11.4	16
Fronto-orbital width.....	10.7	14.5
Width of lower edge of front.....	4.7	6
Width of upper line of front.....	5.6	8
Height of front to postfrontal crest.....	1.6	2.2

DECKENIA MITIS Hilgendorf

Deckenia mitis Hilgendorf, 1898, Deutsch-Ost-Afrika, Lief. ix, Dekap., p. 24, fig. 8.—Rathbun, 1906, Nouv. Arch. Mus. Hist. Nat., Paris, 7, p. 71, text-fig. 123, pl. xix, fig. 7.

1 ♂ (M.C.Z. 7686) Ruvu River, Bagamoyo. 14.XI.29.

OCYPODIDAE

OCYPODE KUHLLI de Haan

Plate 7

Ocypode (Ocypode) kuhlii de Haan, 1835, Fauna Japon., Crust., Dec. 2, p. 58: Indian Ocean.

Ocypoda kuhlii Miers, 1882, Ann. Mag. Nat. Hist. (5) 10, p. 384, pl. xvii, fig. 8-8b.

5 ♂ 5 ♀ (M.C.Z. 7687) Bagamoyo, T.T. 13.xii. 29.

EXPLANATION OF PLATES

PLATE 1

PLATE 1

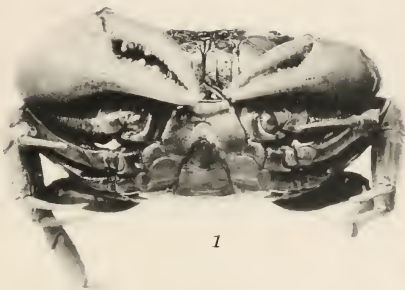
Potamon (Potamonautes) loveridgei ♂ holotype

Fig. 1. Ventral view, showing chelae, nat. size.

Fig. 2. Frontal view, x about $1\frac{1}{2}$.

Fig. 3. Ventral view, showing maxillipeds and sternum, x about $1\frac{1}{2}$.
Note the raised white arch in front of abdominal cavity.

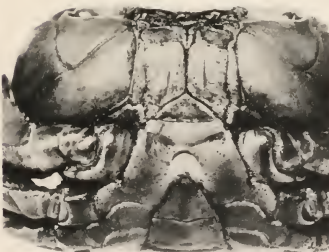
Fig. 4. Ventral view, showing abdomen, x about $1\frac{1}{2}$.



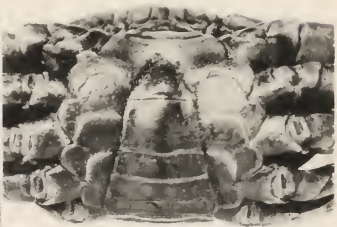
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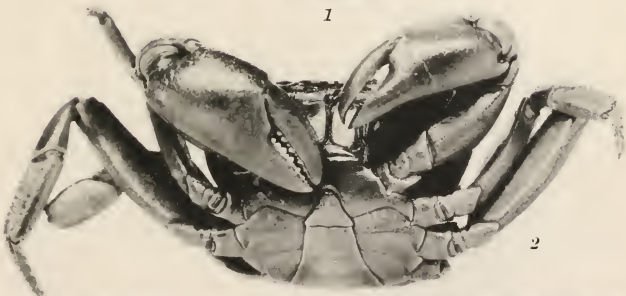
PLATE 2

PLATE 2

- Fig. 1. *Potamon (Potamonautes) johnstoni unisulcatus* ♀, dorsal view, nat. size.
Fig. 2. *Potamon (Potamonautes) johnstoni unisulcatus* ♂ cotype, ventral view,
x 2.
Fig. 3. *Potamon (Potamonautes) loveridgei* ♂ holotype, dorsal view, nat. size.
Fig. 4. *Potamon (Potamonautes) johnstoni unisulcatus* ♂ cotype, sternum and
abdomen, x 3.



1



2



3



4

PLATE 3

PLATE 3

Potamon (Potamonautes) reichardi ♂

Fig. 1. Frontal view, x 2.

Fig. 2. Dorsal view, x 2.

Fig. 3. Ventral view, showing chelae, x 2.



1



2



3

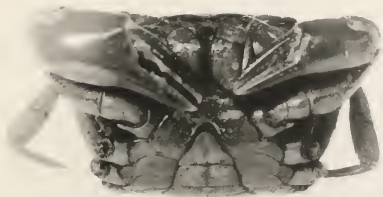
PLATE 4

PLATE 4

- Fig. 1. *Potamon (Geothelphusa) emini* ♂, dorsal view, x 3.
Fig. 2. *Potamon (Geothelphusa) emini* ♂, ventral view, x 3.
Fig. 3. *Potamon (Potamonautes) reichardi* ♂, ventral view showing maxillipeds and sternum, x 2.
Fig. 4. *Potamon (Potamonautes) reichardi* ♂, ventral view showing abdomen, x 2.



1



2



3



4

PLATE 5

PLATE 5

Potamon (Geothelphusa) emini

Fig. 1. ♀, frontal view, x 3.

Fig. 2. ♀, dorsal view, x 3.

Fig. 3. ♂, ventral view, showing maxillipeds, x 4.

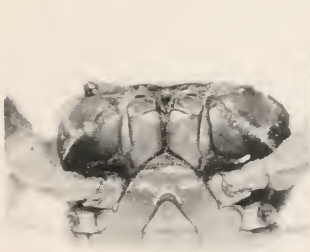
Fig. 4. ♂, ventral view, showing abdomen and sternum, x 4.



1



2



3



4

PLATE 6

.

PLATE 6

Potamon (Potamonautes) usambarae

- Fig. 1. ♀, chelae, x 2.
- Fig. 2. ♀, dorsal view, x 2.
- Fig. 3. ♀, frontal view, x 3.
- Fig. 4. ♂, ventral view, x 3.



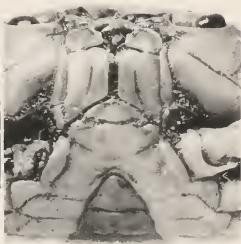
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PLATE 7

PLATE 7

Ocypode kuhlii ♂, about natural size.

Fig. 1. Dorsal view.

Fig. 2. Ventral view.



1



2

187

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Bulletin of the Museum of Comparative Zoölogy

AT HARVARD COLLEGE

VOL. LXXV, No. 6

**REPORTS ON THE SCIENTIFIC RESULTS OF AN
EXPEDITION TO THE SOUTHWESTERN HIGHLANDS
OF TANGANYIKA TERRITORY**

VI

**PARASITIC NEMATODES FROM EAST AFRICA
AND SOUTHERN RHODESIA**

BY J. H. SANDGROUND

CAMBRIDGE, MASS., U. S. A.

PRINTED FOR THE MUSEUM

AUGUST, 1933

No. 6.—*Reports on the Scientific Results of an Expedition to the Southwestern Highlands of Tanganyika Territory*

VI

Parasitic Nematodes from East Africa and Southern Rhodesia

By J. H. SANDGROUND

This report is based on material secured by Mr. Arthur Loveridge of this museum on the occasion of his recent zoölogical collecting expedition to Tanganyika Territory, and on a collection made by the author incidental to the prosecution of certain special helminthological studies in Southern Rhodesia and Mozambique (Portuguese East Africa) at about the same time. The report is restricted in its scope to the nematodes, of which nine new species are here described. The parasitic worms of other groups will be made the subject of later studies.

Preceding the systematic descriptions of the new forms, it has been thought worth while to give a list of other nematodes identified in this collection adequate descriptions of which are already available, which extends either the host or geographic ranges of species. In some instances, owing to an unfortunate insufficiency of material, only the generic identification of the parasites has been possible.

The author desires to record his appreciation to Mr. Loveridge for the opportunity of studying his collection and to Messrs. Glover M. Allen, Outram Bangs and James L. Peters for their kind services in the authoritative identification of the bird and mammalian hosts of the parasites.

The type specimens of the new forms described are deposited in the helminthological collection of the Museum of Comparative Zoölogy, Cambridge, Mass.

MAMMALIA

Primates

Cercopithecus leucampyx

moloneyi

Tanganyika

Oesophagostomum pachycephalum

Streptopharagus pigmentatus

C. l. beirensis

S. Rhodesia

" "

Trichiurus trichiura

Oesophagostomum brumpti

C. aethiops pygerythrus

Mozambique

"

C. aethiops centralis

Tanganyika

"

Colobus badius gordonorum

"

"

pachycephalum

lum

Streptopharagus pigmentatus

Papio (neumannii)?

"

Physaloptera caucasica

<i>Papio porcarius</i>	S. Rhodesia	<i>Streptopharagus pigmentatus</i> <i>Oesophagostomum brumpti</i> <i>Strongyloides fulleborni</i>
Cheiroptera		
<i>Rhinolophus augur zambesiensis</i>	"	<i>Strongylacantha glycirrhiza</i>
Carnivora		
<i>Thos adustus</i>	"	<i>Ancylostoma braziliense</i> " <i>caninum</i>
<i>Felis capensis hindei</i>	Tanganyika	<i>Toxocara mystax</i> <i>Physaloptera praeputiale</i>
Insectivora		
<i>Crocidura nyanzae kivu</i>	"	<i>Amplicæcum</i> sp. (encapsuled larvae)
Hyracoidea		
<i>Procavia brucei frommi</i>	"	<i>Crossophorus collaris</i> <i>Hoplodontophorus flagellum</i> <i>Theileriana brachylaïma</i> <i>Setaria loveridgei</i>
<i>Pedetes dentatus</i>	"	<i>Trichuris</i> sp
<i>Mastomys microdon victoriae</i>	"	<i>Protospirura muricola</i>
<i>Tatera lobengulae</i>	S. Rhodesia	" "
<i>Leggada minutoides</i>	"	" "
<i>Otomys irroratus</i>	"	" "
<i>Cricetomys gambianus</i>	"	<i>Heterakis spumosa</i>

AVES

Accipitriformes		
<i>Falco biarmicus biarmicus</i>	Tanganyika	<i>Dispharynx</i> sp.
<i>F. s. subbuteo</i>	"	<i>Habronema leptoptera</i>
<i>Elanus caeruleus</i>	S. Rhodesia	" "
		<i>Physaloptera alata</i> <i>Porrocaecum depressum</i>
<i>Circæus cinereus</i>	"	
Galliformes		
<i>Guttera edwardi</i>	"	<i>Ascaridia numidia</i> <i>Heterakis brevispiculum</i>
<i>Francolinus coqui hubbardi</i>	Tanganyika	<i>Heterakis</i> sp.
<i>Pternistes cranchii itigi</i>	"	<i>Porrocaecum</i> sp.

REPTILIA

Lacertilia		
<i>Agama agama turnensis</i>	Tanganyika	<i>Strongyluris gigas</i> <i>S. ornata</i> (?) <i>S. ornata</i> (?)
<i>A. atricollis</i>	"	<i>S. brevicaudata</i>
<i>Chamaeleon goetzei</i>	"	"
<i>Chamaeleon tempeli</i>	"	"

<i>Mabuya planifrons</i>	Tanganyika	<i>Physaloptera</i> sp.*
<i>Gerrhosaurus major zechi</i>	"	"
<i>Varanus niloticus</i>	"	<i>Tanqua tiara</i>
<i>Ophidia</i>		
<i>Typhlops punctatus punctatus</i>	"	<i>Kalicephalus</i> sp.*
<i>Boaedon lineatus</i>	"	"
<i>Grayia tholloni</i>	"	"
<i>Trimerorhinus tritaeniatus</i>	"	"
<i>Psammophis sibilans</i>	"	"
<i>Naja melanoleucus</i>	"	"

AMPHIBIA

<i>Rana mascareniensis</i>	S. Rhodesia	<i>Amphibiophyllus acanthocirratu</i> s.
----------------------------	-------------	--

Superfamily TRICHUROIDEA

Family TRICHURIDAE

Subfamily Capillariinae

HEPATICOLA HEPATICA (Bancroft, 1893)

Hosts: *Acomys selousi*, and (?) *Homo sapiens*.

Locality: Mount Silinda, Southern Rhodesia.

At present four species are recognized in the genus *Hepaticola*, on which considerable interest has recently been focussed because of the report of an authentic case of infection with *H. hepaticola* in man. (MacArthur, 1924 and later reports of several human infections in Russia and Panama.)

The type species, *H. hepaticola*, is a relatively long, very fragile worm which lives in the tissue of the liver, primarily of mice, rats, the hare and, in this country, also the coyote. *H. hepatica* enjoys a cosmopolitan distribution coincident with that of its rodent hosts. When the number of worms is high, as it frequently is, considerable destruction of liver tissue occurs with consequent pathological sequelae. Other species that have been described are: *H. soricicola* Nishigori, 1924 from the liver of *Sorex* sp. in Formosa; *H. anthropopithici* Trosier et al., 1928, from the liver of the Chimpanzee in West Africa; *H. gastrica*

*Because of the considerable variation found associated with the so-called specific characters, many of the large number of species that have been proposed in the genera *Kalicephalus* and *Physaloptera* are indistinguishable. I consequently refrain from attempting specific identification of the reptilian representatives of these genera pending more comparative material which will make a critical study possible.

Baylis, 1926, from the stomach of *Rattus norvegicus* and *R. rattus* in Europe; *H. muris* Uzeyama, 1928, from the stomach of *Epimys (Rattus) norvegicus* in Japan.

The morphology of *H. hepaticola*, as well as that of the other species, is rather imperfectly known since even by the most careful dissection it is difficult to extract the fragile sinuous worms from the matrix in which they are intimately embedded. For morphological study usually little more can be secured than fragments of the anterior and posterior parts of the body.

To add to the difficulty of classification, the male worm, which possesses the most important taxonomic characters, is found even less frequently than the female. In consequence of this, the various species established have been based on a presumable specificity of habitat of the worm and certain characteristics of the egg.

In our case, the specific identification has been based primarily on size of eggs, and their comparison in structure and shape with eggs of *H. hepaticola* secured from *Rattus norvegicus* in Boston. The variation in size was found to be from 52 to 58 μ by 27.6 to 29 μ , a figure which falls very well within the relatively extensive range reported by others.

Hepaticola hepatica was found to be very prevalent among field mice at Mount Silinda, the livers frequently being massively infected in all their lobes. Attempts to dissect out entire worms yielded disappointing results.

As has been well established by many workers, the eggs of *Hepaticola hepatica* are usually well walled off by adventitious connective tissue in the liver, and are not released from this organ before the death of the host. Only on rare occasions have they been found in small numbers in the intestinal contents and faeces. Considerable interest from the standpoint of tropical medicine, consequently attaches to our finding a very rich supply of eggs indistinguishable from *H. hepatica* in a stool from a single individual out of several hundreds examined at Mt. Silinda. The individual, a woman of the Ndau tribe, neither displayed symptoms, nor gave any history of any previous illness that might be attributable to a massive *Hepaticola* infestation. By the time that the anomaly of finding the stool heavily laden with the eggs of *H. hepaticola* was realised, the woman, who was a visitor in this neighborhood, had gone away and no further stools could be secured.

In view of the propensity of African natives to consume various forms of rodent life among which rats, porcupines and squirrels may be specifically cited as evidenced by our own observation, it is highly probable, in our opinion, that human cases in which the *Hepaticola*

eggs are found in the stools may be relegated to the growing category of pseudo-parasitism in which eggs found in faeces represent innocent passengers through the human alimentary canal. The helminthological examination of the faeces over several days, when the diet of the patient is controlled, would establish the correctness of this surmise.

Superfamily STRONGYLOIDEA

Family TRICHOSTRONGYLIDAE

Subfamily Trichostrongylinae

HAEMONCHUS LAWRENCEI sp. nov.

Host: *Cephalophus monticola*.

Locality: Mt. Silinda, Southern Rhodesia.

Scrapings of the mucosa of the small intestine, more especially the duodenum of a blue duiker, caught in the rain forest at Mt. Silinda, brought to light an infection with minute colorless nematodes. Later examination of the material, which was fixed in formalin, showed the infection to be a multiple one, involving two, as yet undetermined, species of the genera *Trichostrongylus* and *Cooperia*, and a species of the genus *Haemonchus*, which we think has not previously been described and for which we propose the name *Haemonchus lawrencei* in honor of Dr. W. T. Lawrence of the Mount Silinda mission.

The more important measurements of *H. lawrencei* are given in millimeters in the accompanying table:

	Female	Male
Total length	10.6–11.56	7.6–9.9
Maximum breadth	0.32	0.24
Length of Oesophagus	1.0–1.07	0.96–0.98
Antr. end to exor. pore	0.21	0.22–0.27
Antr. end to cervical pap.	0.3–0.35	0.29
Vulva to postr. end	0.147 to 0.155	
Anus to postr. end	0.035 to 0.377	
Eggs	0.065 x 0.038 to 0.082 x 0.043	
Gubernaculum	Measured on dissected specimens	0.150–0.160
Spicules		0.340–0.36
Distance of barbs to tip of spicules		0.029–0.035 (1st) 0.061–0.066 (2nd)

The worms, of which we have carefully examined more than twenty examples and compared with the type species *Haemonchus contortus*

from various hosts, besides being definitely smaller than any of the species previously described in the genus, may be readily distinguished from all others except *H. vegliai* LeRoux by the presence, on both right and left spicules, of a barb-like prominence some distance from the normal terminal barb.

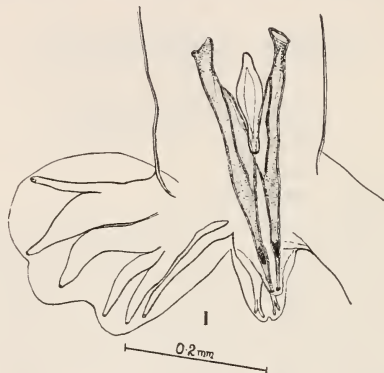


Fig. 1. *Haemonchus laurencei*, n. sp. Ventral view of bursa showing bursal lobes and rays of one side, genital cone, spicules and gubernaculum.

It apparently is also to be contrasted with other species in the genus in that the dorsal lobe of the bursa (fig. 1) is symmetrical with respect to the two lateral lobes and does not take origin from the base of the left lateral lobe. Aside from these points, the morphology of the parasite is characteristic of the genus. Incidentally it may be noted that, while in the majority of female specimens the vulva is provided with a salient linguiform process, in other specimens, although these are mature and gravid, the vulva has no conspicuous lips. This observation brings further support for the view expressed by several authors to the effect that the presence or absence of a linguiform process cannot be legitimately used as a specific criterion and hence, insofar as this feature is stressed, the validity of *H. cerrinus* Baylis and Daubney 1922, and of *H. similis* Travassos 1914, is doubtful.

AFFINITIES

The size range of *H. laurencei* is distinctly smaller than that described for other species, and similar relatively diminutive dimensions

apply to the various organs of the body. Because of variation within the species in this genus, the size criterion, if it can be used at all, must be applied with caution as a specific character. The length of the spicules within limits, however, appears to be constant in specimens of different size, and Le Roux (1929, p. 452) asserts the value of the spicule

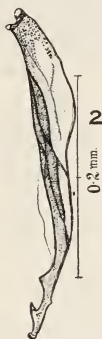


Fig. 2. *Haemonchus laurencei*, n. sp. Isolated left spicule magnified.

characteristics, more especially the position of the barbs, in distinguishing the various species. The possession of two barbs on the spicules is a character shared apparently only with *H. vegliai* (Le Roux 1929) but size of the gubernaculum and total length of the spicules seem to be sufficient to establish the distinction between these two species.

Family ANCYLOSTOMIDAE

Subfamily Necatorinae

NECATOR AMERICANUS (Stiles, 1902)

Host: *Papio porcarius*.

Locality: Near Mt. Silinda, Southern Rhodesia.

A single male specimen of the genus *Necator*, approximately 9 mm. in length, was found attached to the wall of the duodenum of one of seven baboons shot in this locality. The genus has, to my knowledge, never before been recorded from the baboon, although two species, namely *N. cxilibdens* Looss, 1912 and *N. congolensis* Geddoelst, 1916

have been described from the Chimpanzee. *N. americanus*, the species that commonly parasitises man, has, however, been recorded from the gorilla. A large porportion of the natives in this region are infested with *N. americanus*, and for this reason the specimen found in the baboon is attributed to the same species, it being well known that certain parasites which have chanced to invade a host only partially suitable for their development will be stunted in their growth. Aside from the general dwarfing, the specimen from the baboon could not be distinguished from specimens of *Necator americanus* of human origin.

Superfamily OXYUROIDEA

Family OXYURIDAE

Subfamily Oxyurinae

SYPHACIA PARAXERI sp. nov.

Host: *Paraxerus palliatus*.

Locality: Mt. Silinda, So. Rhodesia.

Numerous specimens of a typical species of *Syphacia* were examined from this host. The male possesses only two cuticular mamelons, a character shared with only two previously described species of the genus, namely *S. pallaryi* Seurat, 1915 from *Xerus getulus* and *S. pearsi* Baylis, 1928 from *Heliosciurus isabellinus*.

In the accompanying table the principal morphological measurements (in millimeters) of these two species are set down for comparison with those of the species here described.

As will be seen from the above measurements *S. pallaryi*, *S. pearsi* and *S. paraxeri* are closely related. They do not appear to exhibit any differences in morphology. Aside from size criteria, which in our material do not show great variations, *S. paraxeri* and *S. pearsi* are to be readily distinguished from *S. pallaryi* by the posterior position of the vulva relative to the end of the oesophagus and also by the relative positions of the two mamelons, the anterior mamelon in *S. pallaryi* being in the middle of the body while in *S. paraxeri*, as in *S. pearsi*, both mamelons are situated nearer the cloacal region. *S. paraxeri* may be differentiated from *S. pearsi* by the relative size of the body of both sexes, distinctly smaller eggs, tail and spicules. Like *S. pearsi*, the gubernaculum of *S. paraxeri* appears, even under the highest magnification, to be devoid of a terminal barb-like hook such as is noted in *S. pallaryi* and *S. thompsoni* Price, 1928.

	<i>S. pallaryi</i>		<i>S. pearsii</i>		<i>S. paraxeri</i>	
	♂	♀	♂	♀	♂	♀
Length	2.0	2.9	1.9-2.0	3.2-4.0	1.6-1.7	4.6-5.3
Max. breadth	0.18	0.275	0.13	0.24	0.096	0.220-0.260
Length of oesophagus (including bulb)	0.40	0.43	0.34-0.36	0.380-0.480	0.220-0.230	0.330
Ratio of oesophagus	1/6	1/5	(-1/5)	(ca. 1/7)	1/7	1/14
Vulva from antr. end		ca. 0.5		0.70-0.850		0.63-0.82
Length of tail	0.13	ca. 0.5	0.18-0.23	0.70-0.850	0.12-0.13	0.59-0.70
Size of eggs		0.084 x 0.025		0.100 x 0.037		0.081-0.087 x 0.029-0.032
Length of spicule	0.084		0.130		0.072-0.076	
Length of gubernaculum	0.055		0.070		0.047-0.050	

Family HETERAKIDAE

Subfamily Heterakinae

HETERAKIS SILINDAE, sp. nov.

Host: *Pternistis afer swynnertoni*.

Locality: Mt. Silinda, Southern Rhodesia.

The new species described below is based on some twenty male and female worms found in the rectal caeca of the red-necked francolin of Mashonaland.

The worms are rather slender in build. The anterior extremity is gently curved dorsally and the body tapers gradually from about its middle point to a finely drawn tail. The three dome-shaped lips are relatively large with small but prominent subapical papillae. Lateral alae, that arise near the head on either side, reach their greatest width, 0.074 mm., at the level of the middle of the oesophagus and extend along the anterior third of the body.

The principal measurements of the organs, tabulated below, together with the diagram illustrating the arrangement of papillae and other structures at the caudal extremity of the male should suffice for the recognition of the species.

	Male	Female
Total length	9-10.5	11-12.5
Maximum width	0.41	0.43
Pharynx	0.074	0.074
Oesophagus (including bulb)	1.07	1.25
Tail	0.53	0.96
Nerve ring from antr. end.	0.37	0.39
Excretory pore from antr. end.	0.51	0.53
Vulva from antr. end.		6.25
Eggs		0.066 x 0.040

In the male the sucking disc, situated from 0.18 to 0.20 mm. in front of the cloaca, measures 0.095 mm. in diameter, including the wide outer rim.

The spicules are spike-like with large heads and thick tapering shafts. They are equal in size, measuring 0.44 to 0.46 mm. in length.

There are thirteen pairs of ventral caudal papillae. The first pair of these are small but readily detected in ventral view and are situated some distance in front of the sucker, just behind the heads of the spicules. The remaining twelve posterior pairs of papillae are distributed in the normal manner as exemplified in the type and certain other species of the genus and as figured in the accompanying diagram.

Among other characters of minor importance, it is the constant possession of the anteriorly situated pair of papillae that serves to distinguish

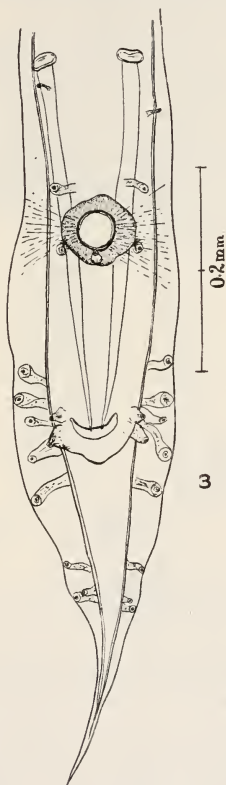


Fig. 3. *Heterakis silindae*, n. sp. Caudal extremity of male; ventral view.

H. silindae from other species of the genus which have thirteen pairs of caudal papillae, such as *H. beramporia* Lane, 1914, *H. bonasae* Cram, 1927, etc.

STRONGYLURIS PARADOXUS, sp. nov.

Host: *Hagedashia hagedash nilotica* (Glossy Ibis)

Locality: Mwanza, Tanganyika Territory.

Eight specimens of an Oxyuroid that must be referred to the genus *Strongyluris* Müller, 1894, were found in the same vial with material described below as *Contracacum hagedashiae*, n. sp.

Since these worms conform in all particulars with the definition of the genus, there is no need of a detailed description. It is probable that the measurements of the chief morphological features given in tabular form below and diagrams of the male and female caudal extremities will suffice for their recognition.

	Male	Female
Length*	11.-11.5	11.2-12.3
Maximum breadth	0.6- 0.65	0.70
Height of lips	0.042	0.043
Pharynx	0.22	0.26
Oesophagus	1.85	2.0
Tail	0.12	0.25
Diameter of sucker	0.105	
Sucker from postr. extremity	0.127	
Vulva from postr. extremity		4.1-4.4
Caudal papillae postr. extremity		0.090
Spicules	1.1-1.2	
Eggs		0.065-0.071 x 0.040-0.047

We have closely compared the material with the following species of *Strongyluris* from East and West Africa in our collection: *S. brevicaudata* Müller from *Agama* spp. *Mabuya* spp. and *Chamaeleon* spp., *S. gigas* Spaul from *Agama agama dodomae*, and *S. (?) ornata* Gendre from *Agama atricollis* and find that, in general appearance and details of structure, it most closely resembles *S. brevicaudata* as this species is understood by Taylor (1924). Our form differs from other species in the genus in that there are 8 pairs of caudal papillae instead of the usual 10 pairs. There is only a single pair of sessile, median, post-anal papillae and but two pairs of slender stalked papillae in the terminal caudal region, in place of the two and three pairs of papillae that regularly are found respectively in these situations.

Aside from the number of papillae, *S. paradoxus* is distinguishable

*All measurements are in millimetres.

especially from *S. brevicaudata* in that the caudal alae in the male are reduced to a mere vestige discernable only when the worm is seen from the lateral aspect.

The several species of the genus *Strongyluris* have hitherto been recorded exclusively from lacertilians. This is the first time that it is

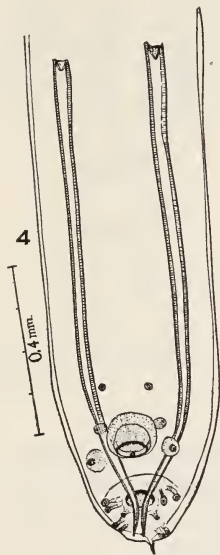


Fig. 4. *Strongyluris paradoxus*, n. sp. Caudal extremity of male; ventral view showing distribution of papillae.

reported from a bird. Had there not been specimens of the typically avian genus *Contracaecum* in the same vial, there might be strong grounds for suspecting a mislabelling of the host. Mr. Loveridge, however, assures me that such a confusion is not likely. Another possible explanation for such an unusual host relation is that the parasites represent the undigested remains from a lizard previously eaten by the host. This likewise seems improbable, since *Hagedashia hagedash* is a

wading bird, feeding, so far as is known, on aquatic food found in the muddy bottoms of the shallow streams that it frequents, where lizards



Fig. 5. *Strongyluris paradoxus*, n. sp. Caudal extremity of male; lateral view showing distribution of papillae.

are not likely to occur. It may be mentioned that our material is in a fine state of preservation indicating that the parasites were living at the time of fixation.

Family SUBULURIDAE

Subfamily Subulurinae

SUBULURA CALLOSA, sp. nov.

Host: *Petrodromus tetradactylus*.

Locality: Mt. Silinda, Southern Rhodesia.

The only nematodes found in three elephant shrews examined in this locality were two males of an Heterakid genus recovered from the large intestine. In so far as the worms do not entirely conform to the generic definition of what appears to be their closest relatives, we think it best to identify them provisionally with the genus *Subulura sensu lato*.

The worms are creamy white in color; body straight with posterior extremity curved slightly in ventral direction. They measure 7.8 mm. and 8.2 mm. with maximum breadth (near the middle of the body) of 0.54 and 0.62 mm. respectively. Body tapers to an obtuse anteriorly

directed mouth. Posterior to the cloaca there is a rapid tapering to an acutely pointed conical tail. There are a pair of translucent lateral cervical alae 36μ at their widest point which commence at the head and extend as far as the middle of the anterior cylindrical portion of the oesophagus where it disappears insensibly into the dense cuticle which covers the remainder of the body. This cuticle, which is extraordinarily thick (25μ), shows an exceedingly fine striation in addition to a superimposed corrugation or broad annulation. Lateral cervical papillae are not discernable. The mouth, 60μ wide, is limited laterally by apparently two indistinct lips provided each with three papillae of which the lateral are more massive than the submedian. There is a well developed buccal cavity, 50μ deep, characteristically divided into

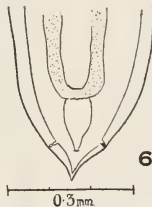


Fig. 6. *Strongyluris paradoxus*, n. sp. Caudal extremity of female; ventral view showing lateral papillae.

an upper compartment about 25μ broad and 30μ deep with heavily cuticularised walls, and a lower infundibuliform chamber, from the base of which there project three massive blunt teeth. The oesophagus, measuring 0.88 mm. in length, is divisible into two well-defined parts. The anterior part, with thick muscular walls, is club-shaped and its broad base is constricted off into a narrow isthmus that connects it with a spherical bulb, 0.21 mm. wide, provided with cuticularised valves. The intestine is straight and opens through a well-defined rectal portion at the cloaca about 0.23 mm. from the extremity of the tail. An ampulliform cloacal gland may be seen at the side of the rectum discharging apparently into the cloacal cavity. The cloacal aperture is spacious but there are no salient cloacal lips. Caudal alae absent. Some 0.67 mm. in front of the cloaca is a massive sucker practically circular in outline (0.154 mm. diameter) with a "chitinous" rim nearly 30μ wide. There are 8 pairs of stalked caudal papillae. The first pair are large and parasuctorial in position. The second pair also

large, are a little more than half way toward the cloaca. The third pair are smaller and just precloacal in position. The fourth and fifth pairs of papillae are large and disposed side by side at the level of the cloaca. The sixth, seventh and eighth pairs of papillae grow progressively smaller. (See fig. 6.)



Fig. 7. *Subulura callosa* n. sp. Caudal extremity of male; ventral view.

✧ The spicules are similar and seemingly equal in length. The proximal end is slightly dilated; the shaft is of uniform width (18μ) and the distal pointed ends bear a narrow membranous expansion. The length of the spicules is 440μ . The gubernaculum as seen from the side is more or less awl-shaped with a broad head and pointed distal end. It measures 140μ in length.

Systematic Affinities. It is in relatively recent times that the multiplicity of species formerly attributed to the extensive genus *Heterakis* have been divided up and distributed among two families,—the

Heterakidae, Railliet and Henry, 1914, and the Subuluridae, Yorke and Maplestone, 1926, distinguished chiefly by the presence of three well-defined lips, a simple pharynx without teeth and a circular chitin-bound preanal sucker in the male of the Heterakidae, and ill defined lips, a buccal vestibule with teeth in its base, and an elongate pseudo-sucker in the male of the Subuluridae. There is no question but that this division has, in the main, been practical, and taxonomically convenient. The presence of a well-developed preanal sucker with a strong chitinous rim in material described in the present paper would require its classification with the Heterakidae but otherwise its morphology especially of the buccal cavity proclaims it a very typical member of the Subuluridae. Aside from the presence of a circular preanal sucker with a chitinous rim and the fact that the left spicule is equal in size and in the extent of its chitinization with the right, the form may be regarded as congeneric with the genus *Numidica*. Baylis (1930) has brought out that the distinction between the genera *Numidica* and *Oxynema* is a dubious one, and it is questionable whether a generic distinction between *Numidica* and *Subulura* is entirely justifiable. In consequence of this, rather than to create a new genus we have referred our specimens to the genus *Subulura*, the diagnosis of which will accordingly require emendation. However, it appears desirable to defer such an action until the female of *S. callosa* is available to complete the study. The species, which we have here described, increases the doubts raised by Baylis and at the same time affords an interesting connecting link, at least so far as presented by the morphology of the male, between the genera *Heterakis* and *Subulura*.

Superfamily ASCAROIDEA

Family HETEROCHEILIDAE

Subfamily Anisakinae

CONTRACAEUM HAGEDASHIAE, sp. nov.

Host: *Hagedashia hagedash nilotica*.

Locality: Mwanza, Tanganyika Territory.

Although more than 20 specimens of the species are at hand, it is not possible to give a complete description since the females, while having the sexual organs developed, have not attained full maturity. For the most part, the worms are enveloped in a triple layer of cuticle, which no doubt represent the unshed cuticles of the third and fourth larval

stages. By stripping off these coverings, the caudal papillae of the males are plainly discernable, and it is on the assumption that these structures constitute the full complement of the adult worm that the species is described as new. Because of the relative immaturity of the material, all measurements must be regarded as minimal ones subject to a further accretion before the fully mature condition is attained.

The worms are creamy white in color with a deep transverse striation of the cuticle. The lips, three in number, are more or less quadrangular in shape and are set off from the body of the worm by a shoulderlike annular constriction. (Fig. 7.) The interlabia narrow

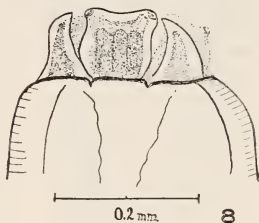


Fig. 8. *Contracaecum hagedashiae*, n. sp. Cephalic extremity.

from the base upwards and curve inwards between the lips. The length of male and female specimens is up to 34 mm. and 43 mm. respectively. In the largest females the oesophagus is 9.1 mm. long. In another female specimen, about 40 mm. long, the oesophagus measures only 3.4 mm. Such a striking variation in the relative length of this organ is seldom recorded and indicates the caution that must accompany the use of this ratio for purposes of taxonomy. The anteriorly directed intestinal caecum is about two-thirds of the length of the oesophagus. The posterior appendix measures from 0.89 to 1.25 mm. in length. The vulva opens inconspicuously on the external surface 12.5 mm. from the anterior end in the largest specimen. The posterior extremity tapers gradually to an acute point. The anus is subterminal, 0.08 mm. from the extremity. As already stated, none of the females are gravid.

The tail of the male is conoid in shape. The anus opens 0.12 mm. from the extremity. There are at least 65 pairs of minute preanal papillae extending along the sublateral field to a point 3.2 mm. anterior

to the cloaca. There are a pair of papillae on each side in the adanal position. Postanally there are six pairs of papillae, (including one papilla that has a double appearance) on each side of the tail (Fig. 9). The spicules are equal in length and measure 1.25 mm. with a breadth of 0.025 mm. No trace of a gubernaculum was found.

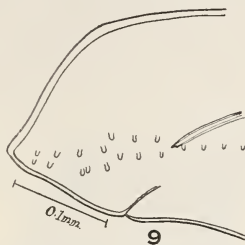


Fig. 9. *Contracaecum hagedashiae*, n. sp. Caudal extremity of male showing papillae.

This species may be distinguished from all previously described avian members of the genus by the characteristic arrangement of the postanal papillae and the unusually large number of preanal papillae in the male.

DUJARDINIA, sp. indet.

Host: *Myonax grantii*.

Locality: Kigogo, Tanganyika Territory.

The material consists of four females and several small larvae and is, unfortunately, not in a satisfactory condition to make specific identification possible. The genus, which is readily identified by the structure of its oesophagus, has previously been recorded from fishes, reptiles and marine mammals (Dugong). It may consequently be a foreign or spurious parasite in the mongoose, where its presence is to be accounted for as the undigested remains of a previously consumed reptile.

AMPLICAECUM INVOLUTUM (Gedoelst, 1916)

Hosts: *Bufo regularis* and *Dispholidus typus*.

Locality: Mt. Silinda, Southern Rhodesia.

In addition to a small infection found in *Bufo regularis*, the type host of *A. africanum* Taylor, 1924, the same species of parasite was found in

large numbers in *Dispholidus typus*, a colubrine snake. The genus has previously been recorded from Amphibia, Lacertilia and Aves. The present is apparently the first record from the Ophidia. Khalil has recently (1926) tabulated the main characters of the species of this genus. From his table it is apparent that *A. africanum* is very closely related to *A. involutum*, a species apparently overlooked by Taylor. The main differences that could be used to separate *A. africanum* from *A. involutum*, as these species have been described, are slight differences in the spicule length and the presence in *A. africanum* of a single pre-anal papilla. This papilla is not present in material from either of our hosts and the length of spicules (0.765–0.98 mm.) covers the range of both Gedoelst's and Taylor's species. They are apparently the same form, and on grounds of priority *A. africanum* should, in our opinion, be placed in the synonymy of *A. involutum* (Gedoelst) Yorke and Maplestone.

Superfamily SPIRUROIDEA

Family SPIRURIDAE

Subfamily Arduenninae

ARDUENNA AFRICANA, sp. nov.

Hosts: *Mastomys (Epimys) microdon victorae* — Rungwe Mt., Tanganyika.
Rhabdomys pumilio diminutus, Dabaga, Uzungwe Mtns. Tanganyika.
Boaedon lineatus — Unyanganyi, Turu, Tanganyika.

The numbers of specimens derived from the three sources indicated above are respectively, 16, 7 and 18. Despite careful search for constant differences of a significant order in this material, we have failed to detect anything that would warrant its being considered as representing more than one species. On general principles, however, it seems probable that *Boaedon lineatus* is not a true host of the parasite, its presence in the snake being explainable on the assumption that the worms represent the undigested residue from the true host previously consumed by the reptile. On the other hand, it may be noted that the specimens from the snake are in as good a condition of preservation as are those from the rodent sources.

The following description covers the material from the three hosts mentioned above:

Specific diagnosis: Arduenna of relatively large size with the characters of the genus.

The cuticle is finely annulated by striations 7μ apart. Cervical papillae acicular, exceedingly minute and difficult to find. In male specimens, they were observed asymmetrically disposed, the right papilla at the level of the nerve ring, the left 105μ to 140μ anterior to this point. In favorably mounted specimens a very narrow cervical ala may be seen on the left side arising immediately behind the cervical papilla and extending about half the length of the oesophagus.

The mouth opening is bounded dorsally and ventrally by two trilobed lips guarded by the usual pair of fine teeth which arise from the anterior edge of the pharyngeal walls.

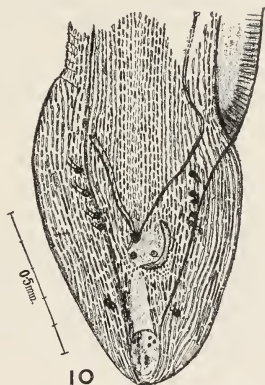


Fig. 10. *Arduenna africana*, n. sp. Caudal extremity of male. Ventral view. Specimen from *Mastomys microdon victoriae*.

The pharynx, with spiral markings, measures 110μ in smaller specimens to 147μ in the largest; it is from 41 to 44μ wide with walls about 11μ thick. Its base is marked by an annular ring about 15μ wide.

The oesophagus is composed of a narrow, anterior portion, about 0.35 mm. long, and a wider glandular portion posteriorly. In the female the entire oesophagus measures from 2.3 mm. to 3.5 mm. in length, this being from $1/8$ to $1/11$ th of the body length. In the male, the oesophagus is relatively shorter, being on the average $1/6$ th of the total length.

The nerve ring encircles the oesophagus near the junction of its anterior and posterior divisions, from 0.34 to 0.46 mm. from the ante-

rior extremity of the body. The excretory pore is about 150μ posterior to this point.

The *females* vary in length from 24 to 44 mm. and in maximum breadth from 0.5 to 0.7 mm. Posteriorly the body is gradually attenuated to end in a bluntly pointed tail. The anus is situated 0.30 to 0.53 mm. from the caudal extremity. The vulva is not salient on the external surface, and must be diligently sought for. Its position oscillates around the middle point of the worm, dividing the body in proportion of 1:0.55 to 1:1.5. The eggs embryonated in utero, with fairly thick, even, walls, measure from 32 to 43.4μ by 17 to 25.3μ . These variations in the size of the eggs and in the relative position of the vulva apply to worms from each of the three hosts from which our material was derived.

The *male*, when full grown, is from 18 to 21 mm. in length with a maximum breadth averaging about 0.66 mm. Among the worms taken from *Mastomys*, however, there was found a male of distinctly diminutive size, measuring 12.5 mm. in length and 0.44 mm. at its widest point. The caudal region of this specimen exhibited the typical characters of the other male specimens and we are consequently constrained to believe that the specimen, while bearing all the adult characters, is mature but not yet grown to full size. The caudal extremity of the male is always tightly coiled ventrally, making it difficult to orient the specimen so as to secure a good view of the ventral surface, but by tedious manipulation and, occasionally, by severing the posterior end, we succeeded in securing ideal preparations of four males. Clearing in hot lacto-phenol enables one to make out all the details of the spicules and to measure these structures with a good degree of accuracy otherwise not obtainable.

In the full grown male the caudal wings are practically symmetrical on both sides. They extend from a point 1.05 mm. from the posterior extremity. They are covered ventrally by serial rows of elongate boss-like thickenings of the cuticle. The alae are supported by 5 pairs of long pedunculate papillae; four pairs are preanal and one postanal. Of the preanal papillae, the first three pairs are almost equidistantly separated, while the fourth pair closely approximates the third. Viewing the worm from the side, one may observe that the papilla sense organs are situated almost on the very edges of the alae. The anus is situated about 0.52 from the end of the body. Ornamenting its right side is an elevated band of cuticle semilunar in shape and carrying more or less sharp serrations on its edge. Within this semilunar area there are two fairly large, sessile papillae in the post-anal position. Towards the

extremity of the ventral surface of the tail is an oval area free from cuticular bosses and displaying, when suitably cleared, ten pairs of relatively minute papillae; three pairs arranged in a triangle and two pairs in tandem series at the base of the tail.

The spicules are unequal and dissimilar. The right, a little wider but considerably shorter than the left, is from 0.515 to 0.61 mm. in length and the average thickness of its fluted shaft is 0.022 mm. The left spicule, which usually takes up a broadly sinuous position, shows considerable variation in its length, being from 1.62 mm. to 2.85 mm. in fully grown specimens. (In the small stunted male specimen mentioned above, the left spicule measured 2.80 mm.) The width of the left spicule averages about 10μ . A true gubernaculum is not present, but in one specimen a slight hyaline thickening of the wall of the rectum or of the muscles in the neighborhood of the anus, so simulated an accessory piece that it might have been taken for one had no other specimens been examined.

AFFINITIES

Until Schulz (1927)¹ described *Arduenna katussi* from various rodents from Southern Russia and Turkestan, only two species, namely *Arduenna strongylina* (Rudolphi, 1819) and *A. dentata* (v. Linstow, 1904) had been attributed to the genus. *A. strongylina* is a fairly common parasite in the stomach of the hog and wild boar and its distribution is apparently coincident with that of its host; on the other hand, *A. dentata* which is also from the hog, has only been recorded from the Orient.

In the accompanying table, the measurements of the taxonomically important organs are given for the three previously described species together with those of *A. africana* described above.

Although the size of the body and of its various organs may be of service in distinguishing *A. dentata*, for the other species, as will be seen from the foregoing table, a consideration of size alone has little, if any, differential value.

The position of the vulva is often difficult to detect without resorting to dissection. Railliet and Henry have questioned the accuracy of von Linstow's determination of the relative position of this organ in *A. dentata*. However, a markedly anterior position of the vulva appears to be one of the chief distinguishing features for *A. katussi*. In the

¹ I am indebted to Dr. N. A. Borodin of this museum for his translation of Schulz's paper from the Russian.

	<i>A. katussi</i> (from Schulz, 1917)		<i>A. strongylina</i> (from Foster, 1912)		<i>A. dentata</i> (from Foster, 1912)		<i>A. africana</i> Sandground	
	♀	♂	♀	♂	♀	♂	♀	♂
<i>Measurements in mm.</i>								
Length	28.5	13.3	16-22	10-15	40-55	25-35	24-40	12.5-21
Max. breadth	0.425	0.24	0.368	0.30-387	1.10	0.7-.8	0.5-.7	0.66
Pharynx	0.114		0.83-0.98		0.11		0.11-0.147	
Oesophagus and relation to total length.	2.58($\frac{1}{11}$)	2.58($\frac{1}{6}$)	3.1-3.7($\frac{1}{4}$)		($\frac{1}{8.6}$)		2.3($\frac{1}{10}$)	3.17($\frac{1}{6.3-5.7}$)
Commencement of cervical alae from antr. end.	0.228	0.152		0.28	—	—	0.48	
Nerve ring to anterior end	0.266	0.256		0.35	—	—	ca. 0.34-0.46	
Excretory pore to antr. end	0.387	0.332		0.48	—	—	ca. 0.5-0.6	
Division of body by vulva	1:8.6		1:1.2		1:3		1:0.55-1:1.6	
Anus to posterior end	0.3		0.21-0.27		—		0.3-.053	
Eggs	.039 x .024		.034-.039 x .020		.039 x .017		.032-.040 x .017-.025	
Left Spicule	1.25		2.24-2.95		3.75-4.23 (0.92)*		1.62-2.8	
Right Spicule	0.311		0.457-.619		0.54-.65 (0.35)*		0.53-.61	

* measurements of von Linstow (1904)

other species, the position of the vulva vacillates around the middle of the worm, tending towards a definitely posterior position. Our examination of immature worms from *Mastomys* indicates that the variation in the position of the vulva is to a certain extent to be correlated with the size of the individual.

Because of the considerable variations exhibited within the species, it appears that neither the absolute size nor the size relationship that the spicules bear towards each other can be regarded as a specific differential character.

The most significant characters, then, upon which the distinction between the different species in the genus appear to rest, are the secondary sexual characters of the male. The serrated elevation known as the pericloacal crown which forms a complete circle around the cloaca in *A. dentata* distinguishes this species from *A. strongylina* and *A. africana* where it is crescentic or semilunar in shape. A pericloacal crown is neither described nor depicted for *A. katussi*. A similar structure is present in *Streptopharagus baylisi* Ortlepp, 1925. Le Roux (1930) regards this serrated ridge as an artifact not discernable in living material and produced by the pressure of the coverslip on the rather loose cuticle of the male venter. In this view I am unable, however, to concur, since it is a definite structure produced by a peculiar arrangement of cuticular bosses in some species and apparently not in others, and in the species where it occurs it can often be demonstrated without subjecting the region of the venter to any uneven pressure.

The number and distribution pattern of the sessile papillae, or caudal pores as they have sometimes been called in other genera, on the ventral surface of the caudal extremity in the male at present appears to be the most constant specific character available for comparative purposes. Further investigations in other species may, I suspect, show them to be uniformly present in all species. These diminutive papillae have not been described in *A. dentata*, and Foster (1912, p. 14) was unable in his American material to corroborate the presence of the five pairs of terminal caudal papillae depicted by Ciurea (1911) in *A. strongylina* from hogs in Roumania, a difference which reflects either on the accuracy of Foster's observations on this point, or indicates a specific difference in the material examined by these two authors. In addition to the 5 pairs of pedunculate papillae present in all species of the genus, Schulz in *A. katussi* describes an unpaired preanal papilla, a postanal pair of sessile papillae and three single diminutive papillae at the caudal extremity. In *A. africana*, as in *A. strongylina* as depicted by Ciurea, there are five pairs of terminal papillae, but their

topographical arrangement is different and in addition *A. africana* may be distinguished by the possession of a pair of large post-anal papillae.

KEY TO THE SPECIES OF ARDUENNA

- | | | |
|------|---|-----------------------|
| I. | Pericloacal crown absent; gubernaculum present, vulva markedly anterior | <i>A. katussi</i> |
| | Pericloacal crown present; no gubernaculum | II |
| II. | Pericloacal crown circular; vulva posterior | <i>A. dentata</i> |
| | Pericloacal crown crescentic; vulva near middle | III |
| III. | Postcloacal sessile papillae absent | <i>A. strongylina</i> |
| | Postcloacal sessile papillae present | <i>A. africana</i> |

Family PHYSALOPTERIDAE

Subfamily Physalopterinae

THUBUNEA GRAYIACOLA, sp. nov.

Hosts: *Grayia tholloni* and *Bitis arietans*.

Locality: Ukerewe Island, Tanganyika.

THUBUNEA AGAMAE, sp. nov.

Host: *Agama hispida distantis*.

Locality: Lourenco Marques, Mozambique.

The material from the two sources named above differs in such criteria as size, relative position of the vulva in the female and in the pattern of the caudal region in the male. This requires their recognition as separate species. The well-defined genus *Thubunea* is, however, sufficiently homogeneous so that the formal extensive descriptions of the new species is not necessary. Reference to the figures and to the accompanying table, in which are set forth the measurements (in millimetres) of the taxonomically important organs of the two species, should supply all particulars required for their recognition.

The specimens from *Bitis arietans* are all females which, however, could not be distinguished from the females taken from *Grayia tholloni* in the same locality. The material from these two hosts is consequently regarded as belonging to the same species. The genus *Thubunea* has hitherto been recorded only once from the Ophidia [*T. pudica* in *Cerastes vipera* — see Seurat (1914)] and has been con-

sidered as a typically lacertilian form. These two further records of the genus from snakes may call for a change in this view.

<i>Male</i>	<i>Thubunea grayiacola</i>	<i>Thubunea agamae</i>
Length	14-15.1	8.1-9.1
Max. breadth	0.26-0.30	0.2
Pharynx	0.036	0.029
Antr. Oesophagus	0.29	0.18
Entire Oesophagus	2.2-2.31	1.61
Antr. end to cervical papillae	0.255	0.162
Length of Bursa	0.62-0.82	0.37
Breadth of Bursa	0.35	0.28
Spicules	0.072 } (approx.)	0.090 } (approx.)
	0.055 }	0.095 }
Tail	0.37	0.22

<i>Female</i>		
Length	21-28	14-19
Max. breadth	0.41	0.37
Pharynx	0.045	0.040
Antr. Oesophagus	0.44	0.32
Entire oesophagus	2.93-3.03	2.58-3.10
Antr. end to vulva	3.56-3.80	2.58-2.70
Eggs	0.032-.036 x 0.023-.025	0.026-.029 x 0.021-.024
Tail	0.181-0.21	0.130

As will be noted, the two species are distinguishable by size. Further the female of *T. grayiacola*, whose vulva is situated some distance behind the end of the oesophagus can be differentiated from *T. agamae* in which the vulva opens either anterior to or at the same level as the oesophageal end.

Seurat, in his description of the type species of the genus, referred to the difficulty of making observations on the very lightly cuticularised spicules of the male. Baylis (1926 and 1930), who has described two further species of the genus, also mentions this difficulty, and on this account was unable to state definitely whether spicules were present in *T. parkeri*. Our experience in this connection was no different. Even when the caudal region of a specimen was accidentally crushed apart by the oil-immersion objective it was difficult to decide where the delicate spicules end and their retractor muscles are attached. In view of this one is compelled to attach less significance than usual to the estimated size of the spicules as a character for the differentiation of

the species and to give greater value to other characters of the region. For the better study and differentiation of the caudal papillae from the surrounding verruciform elevations of the cuticle, by far the best results were secured by heating the worms slowly in lactophenol. On the basis of constant differences in the number and disposition of the



Fig. 11. *Thubunea agamae* n. sp. Cephalic extremity. Median lateral view.

caudal papillae and in the size and shape of the verruciform elevations at the periphery of the ventral pad, *T. grayiacola* and *T. agamae* are readily distinguished. (Cf. figs. 12 and 13).

Systematic Affinities. The distinction of the two species dealt with in this paper from *T. pudica* Seurat and *T. parkeri* Baylis may be made

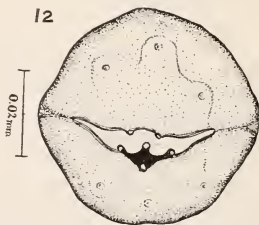


Fig. 12. *Thubunea agamae* n. sp. Cephalic extremity. Frontal view.

on the basis of their smaller eggs and other characters. The only other species to be considered in this connection is *T. asymmetrica* Baylis. The relationship to this species appears to be quite close on account of a similar asymmetric appearance of the lips in both *T. grayiacola* and *T. agamae*, but it may be that such a labial asymmetry is not restricted to the species unit. From an examination of the anterior

extremity of the worms seen in frontal section as well as from the side, it appears that there are two relatively large teeth which arise from the cuticularised pharynx and protrude between the inner surfaces of the lips. These teeth, however, are more closely applied to the smaller, left lip than to the larger right. There are also two more pairs of accessory teeth, the pair on the right lip, being relatively reduced are

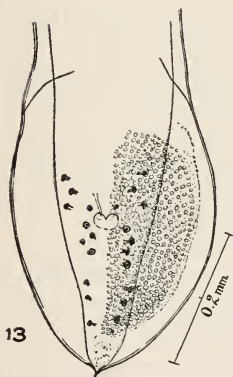


Fig. 13. *Thubunea agamæ* n. sp. Caudal extremity of male. Ventral view.

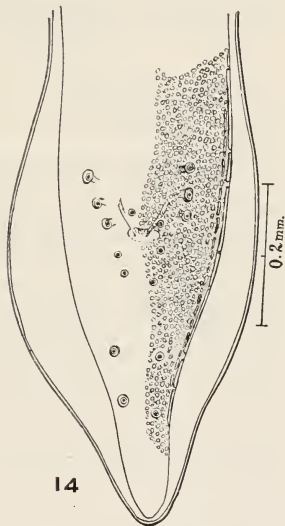


Fig. 14. *Thubunea grayiacola* n. sp. Caudal extremity of male. Ventral view.

less easily seen (figs. 11 and 12). This structure is rather different from that described for *T. asymmetrica* and it is mainly upon this difference that the distinction of *T. agamæ* rests.

Since this manuscript was completed and submitted for publication in December, 1930, the publication by Ortlepp (*Jour. S. Afr. Vet. Med. Assn.*, 1931, Vol. 2:128-131) of a new species of *Thubunea*, *T. fitzsimonsi*, from a Kalahari lizard, *Ichnotropis squamulosa*, has come to

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**BIRD REMAINS FROM THE OLIGOCENE DEPOSITS OF
TORRINGTON, WYOMING**

BY ALEXANDER WETMORE

**CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM
OCTOBER, 1933**

No. 7.—*Bird Remains from the Oligocene Deposits of Torrington,
Wyoming*

BY ALEXANDER WETMORE

For three field seasons the Museum of Comparative Zoölogy has collected fossils in a remarkable deposit near Torrington, Wyoming, that among a wealth of mammals has yielded the largest collection of bones of birds from fossil deposits older than the Pleistocene that have yet been discovered in North America. The bird remains in question have been placed in my hands for study and report on them is given herewith.

According to information supplied by Erich M. Schlaikjer, who has conducted the field work during which this material was collected, the Torrington fossil quarry is located at the head of a canyon, principally in the south half of the northwest quarter of Section 32, Township 24 North, Range 61 West of the Sixth principal meridian.

Mr. Schlaikjer states that "the fossil deposit is of Oligocene age, its stratigraphic position being approximately eighty feet above the Chadron-Brule contact. It presents an outcrop of bones a half mile in length and from one to three feet in thickness. The mammals most abundantly represented are *Mesohippus*, *Caenopus* and *Elotherium*, with remains of birds in most unusual abundance. At a conservative estimate there are at least six bird bones in every cubic foot of the deposit.

"The matrix is a very fine grained pinkish clay and contains a high percentage of calcium carbonate and volcanic ash. Throughout a large part of the deposit the matrix is comparatively hard and is somewhat difficult to work. Where the principal excavations are located, however, the bones occur in soft clay. Above the bone deposit is a two foot layer of clay containing occasional bird and carnivore remains. Above this is a one to four foot layer of white, cherty limestone. Only one or two bone fragments have been found in the limestone."

The bird material, which as has been stated is abundant, is fragmentary, consisting in the main of the articular ends of the metatarsi and tibio-tarsi, with occasional bits from other parts of the skeleton. Rarely a complete bone is encountered. The material is disassociated, except in few instances, viz. an articulated foot. About half the specimens are more or less distorted by pressure, but many are perfect. All are heavily fossilized and are dull white in color.

The collection adds appreciably to our somewhat scanty knowledge of the birds of the Oligocene, as will be indicated in the descriptions that follow.

The drawings illustrating the specimens are the work of Sydney Prentice.

Order FALCONIFORMES

Family ACCIPITRIDAE

Subfamily BUTEONINAE

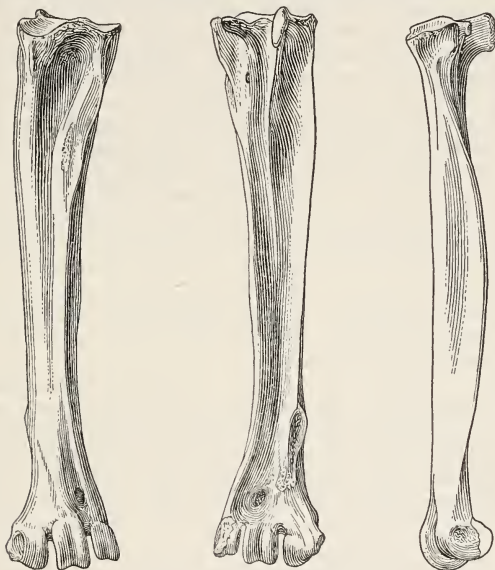
BUTEO ANTECURSOR new species

Characters. Metatarsus similar to that of *Buteo alces* (Wetmore)¹ but posterior semilunar groove more open; second trochlea relatively more massive; facet for articulation of first toe much longer, extending farther up shaft.

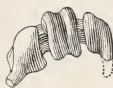
Description. Type, left metatarsus, nearly complete (figs 1-5), Mus. Comp. Zool. Cat. no. 2233, from Upper Oligocene, four miles from Torrington, Goshen County, Wyoming, collected in 1930 by Erich M. Schlaikjer. Proximal face of head roughly rectangular; external glenoid facet very slightly concave, the internal one larger, more deeply hollowed and sloping slightly toward front; intercondylar tubercle low and broad; internal glenoid facet at higher level than outer one; anterior semilunar groove very slightly indicated; posterior semilunar groove deep with inner wall rising high on the projecting talon, and outer wall sloping outward more gradually; external face of head with outline square, internal face with angles rounded; a deep impression on anterior face of upper end of shaft, with the upper end overhung abruptly by the head, merging below gradually with the anterior groove; tibialis anticus tubercle strong, placed externally to center of shaft; shaft strong but slender, somewhat expanded at upper end, contracted slightly toward center, and then flattened and expanded below to support trochlea; anterior groove a shallow, open channel that becomes less evident as it proceeds downward, and finally disappears opposite center of attachment for first metatarsal; outer face of shaft nearly plane, with only a slight concavity evident, expanding gradually from either end in a long slope to center, meeting the anterior face of the shaft throughout its length at a sharp angle; inferior

¹ *Geranoaëtus alces* Wetmore, Ann. Carnegie Mus., vol. 16, April 10, 1926, p. 403, pl. 38, figs. 1-5. Miocene.

foramen moderate, placed in a shallow, sharply marked groove that becomes deeper at the foramen and continues as a sharply marked



Figs. 1-3. Three views of type of *Buteo antecursor*, natural size.



Figs. 4-5. Proximal and distal ends of type of *Buteo antecursor*, natural size.

sulcus to terminate in the external inter-trochlear sulcus; inner margin of shaft compressed to a plate that is thin above, becoming gradually thickened until it terminates at the first metatarsal attachment;

attachment for first metatarsal long, well impressed; external head of talon low, curving outward, with external margin cut by a deep notch, the internal margin rounded; internal head of talon projecting as a thin blade, with internal distal margin slightly hooked, and external margin slightly rounded, sloping below, abruptly at first and then swinging gradually to merge in a long, slightly raised line into the shaft; posterior face of shaft excavated by a broad groove that continues practically throughout its length, both margins being sharply indicated; external trochlea flattened, swung slightly outward, compressed on free margin (which is broken away); middle trochlea broad and strong, with lateral margins swollen, and lateral faces concave, its free surface traversed by a groove that extends clear around the articular surface; internal trochlea with an outwardly projecting, flattened, winglike process, its outer face deeply impressed by a rounded, cup-like depression.

Measurements (of type). Total length 90.8 mm.,¹ greatest breadth of head 16.7 mm., greatest breadth across trochlea 18.1 mm., smallest transverse diameter of shaft 7.8 mm.

Remarks. This new form, somewhat larger than the living ferruginous rough-legged hawk *Buteo regalis*, carries the history of its group back one more step, since previously hawks of this kind have not been known earlier than the Miocene. Its discovery is another indication of the early development of the buteonine type of slow-flying, sluggish hawks that seem to have had as much diversity in the past as in the present time. The regularity with which their fossilized remains are found bespeaks an abundance commensurate with that known for living species before their numbers were decimated by man under mistaken ideas as to their destructiveness to valuable animal life. The group as a whole has had unbroken continuance from the Oligocene period to the present.

The type of *Buteo antecursor* is unusually complete considering its age. The shaft is somewhat twisted by compression but the processes are practically complete so that there is no difficulty in ascertaining its characters.

ACCIPITRIDAE, miscellaneous

In addition to *Buteo antecursor*, described in this paper, there are remains of three additional species of hawks of this family that are represented by bones in too fragmentary condition to allow sufficiently

¹ Bone slightly deformed by compression so that original length may have been slightly more.

certain identification to warrant names. These will be listed here with the hope that further material representing them may come to light with continued work in the quarries at Torrington.

The most important of these is a left humerus lacking the head that comes from an eagle a trifle smaller than *Aquila chrysaëtos*. The distal end of this bone is fairly complete but the shaft has been crushed to such an extent that its original form and proportions are uncertain, and there has been some distortion in the position of the elements of the distal end. The principal peculiarity evident is the position of the radial tubercle which slants inward at more of an angle than in any living species available for examination.

A second eagle, of larger size, is represented by an unguis that is larger than any of the claws of the bald eagle, being equal to the largest in the great monkey-eating eagle of the Philippines, *Pithecophaga jefferyi*, a species that possesses feet of maximum strength and size in this family. Although species have been described from similar specimens in the past the practice of naming such remains is of dubious value due to the confusion that must exist as to their subfamily and generic relationships.

A third species of hawk is represented by the fragmentary distal end of a right tibio-tarsus. This is peculiar in the large size of the internal condyle in relation to the transverse breadth of the bone, differing in this from any of the modern hawks of the family Accipitridae that I have seen. Parts of the external condyle are missing.

Order GRUIFORMES

Suborder CARIAMAE

Family BATHORNITHIDAE new family

Legs only moderately elongated; internal trochlea of metatarsus considerably elevated in relation to middle trochlea; no hallux; talon produced downward in an elongated ridge that merges gradually into level of shaft at about one-fourth to one-third the length of the latter; proportions of anterior phalanges about as in the Cariamidae.

Only one genus, *Bathornis*, with three species is at the present time allocated in this family which was erected originally as the subfamily *Bathornithinae*¹ for the species *Bathornis veredus* Wetmore. The type of *veredus* consisted of the lower end of a metatarsus that in original

¹ Proc. Colorado Mus. Nat. Hist., vol. 7, no. 2, July 15, 1925, p. 13.

study indicated puzzling resemblances to *Cariama* and to the Oedienemidae. Misled by the relative positions of the trochlea, a primitive character, which in *Bathornis* are exactly what is found in the thick-knees, and differ from the modern cariamas, I finally placed this new subfamily in the Oedienemidae. My assumption that *Bathornis* might possibly have a first toe proves since to be without basis.

The more complete material of the two new species of *Bathornis* described beyond in the present paper indicates clearly that the genus is related to the cariamas, though close resemblance in certain details of the entire metatarsus indicates a most interesting similarity to the thick-knees, this being evident in the form of the elongated talon which is quite different from the square, block-like structure of *Cariama*. Fortunately the Torrington material includes a foot, found articulated in position, in which the relative proportions of the phalanges are exactly like that of the Cariamidae and are entirely different from the Oedienemidae; this with other characters shows definitely that *Bathornis* belongs in the suborder Cariamae. The resemblances to the Oedienemidae would seem to be only a most interesting and unusual convergence occasioned probably by similarity in habit.

The three species of *Bathornis*, with the fairly complete information now available regarding their lower limbs, present differences from the Cariamas sufficient to warrant their separation in a distinct family. The relation of the Bathornithidae to the family Hermosiornidae of South America is not entirely clear but from the account of Rovereto¹ the two seem to differ in such a way as to warrant the assumption that they are distinct. According to Rovereto's description and plates *Procariama simplex* has the arrangement of the trochlea quite different from *Bathornis*, and the head of the metatarsus, particularly the hypotarsus, like that of *Cariama*. *Hermosiornis milne-edwardsi* also seems very closely allied to *Cariama*.

BATHORNIS CELERIPES new species

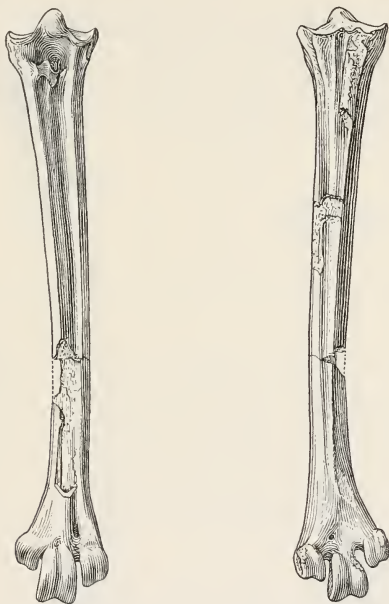
Characters. Metatarsus similar to that of *Bathornis veredus* Wetmore² but decidedly smaller; outer margin of inner trochlea less produced posteriorly.

Description. Type, left metatarsus (figs. 6-11), Mus. Comp. Zoöl. Cat. no. 2234, nearly complete, from Upper Oligocene deposits four miles from Torrington, Goshen County, Wyoming, collected by Erich

¹ An. Mus. Nac. Hist. Nat. Buenos Aires, vol. 25, 1914, 110-114, 163-172.

² *Bathornis veredus* Wetmore, Proc. Colorado Mus. Nat. Hist., vol. 7, no. 2, 1927, p. 11, figs. 19-23. Trigonias Quarry, Chadron Oligocene, Weld County, Colorado.

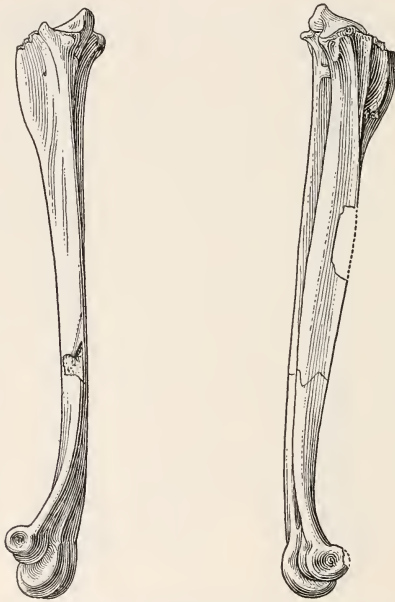
M. Schlaikjer. Proximal face of head irregular in outline, with the two glenoid facets separated by a high intercondylar tubercle that rises abruptly from the anterior margin and slopes down posteriorly to the level of the head of the bone, the inner glenoid facet slightly larger than outer; both facets with raised margins delimiting separate



Figs. 6-7. Two views of type of *Bathornis celeripes*, natural size.

shallow cups, the margins of both rising higher externally; outer facet at a slightly lower level than inner; talon with broad base, marked by a shallow groove that extends transversely across the head of the bone behind the glenoid facets; outer head of talon very slightly indicated as a faint ridge; inner head rising as a strong, heavy ridge with upper end (somewhat imperfect in the type) abruptly rounded; the central

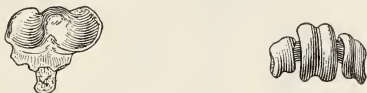
portion with straight outline for a distance, with one tendinal perforation; posteriorly, below the lower end of the perforation mentioned, a thin ridge slopes down to merge with the shaft at slightly below the level of the upper third of the bone, so that, viewed laterally from the inner side, the talon, rising abruptly at the upper end, makes a grace-



Figs. 8-9. Two views of type of *Bathornis celeripes*, natural size.

fully sloping line as it proceeds downward to disappear in the shaft; posterior face of shaft for three-fourths of length marked laterally by sharply angular edges that are raised somewhat, and converge as they proceed downward, the outer margin higher than the inner, and the two bounding a shallow, poorly marked groove; internal surface of shaft concave on side of talon and rounded below; external surface

more nearly plane for two-thirds of length, finally becoming rounded on lower portion; a deep impression on anterior face of shaft at upper end, overhung abruptly by the head, continuing down the shaft as an anterior groove, with raised, rounded margins that extend nearly to lower end; tibialis anticus tubercle strong, placed slightly internal to center of shaft; shaft strong, somewhat slender, robust for upper half and more graceful below, at lower end flattened and expanded to support the trochlea; inferior foramen moderate in size, located low on shaft, with a deeply impressed groove leading into it on anterior surface of shaft; no indication of a first, or posterior, toe; external trochlea blocklike with inner and outer faces deeply excavated, so attached that it is swung posterior to the longitudinal axis of the shaft, rounded



Figs. 10-11. Proximal and distal ends of type of *Bathornis celeripes*, natural size.

in lateral outline, with a distinct groove around free surface; outer margin slightly produced in an angular, plate-like process; middle trochlea strong, rounded in lateral outline, with inner and outer surfaces distinctly excavated and a well impressed median groove completely around articular surface; posteriorly with the external angle cut away and the internal one complete; external trochlea elongated in an antero-posterior direction with inner and outer faces with cup-like excavations and a shallow groove around articular surface; external margin slightly produced in a projecting plate. Bone strongly fossilized, ivory in color.

Measurements. Type, total length (approximate) 98.8 mm., transverse diameter of head 15.8 mm., least transverse diameter of shaft 6.6 mm., transverse diameter across trochlea 16.0 mm.

A second specimen (Cat. no. 2235) measures, total length (approximate) 105.0 mm., transverse diameter of head 14.9 mm., transverse diameter of trochlea 14.7 mm.

Additional metatarsi (fragmentary) transverse diameter of head ¹ 14.7-17.1 (15.6) mm., least transverse diameter of shaft ² 15.7-16.4 (16.1) mm., transverse diameter of trochlea ³ 14.7-16.5 (15.6) mm.

¹ 9 specimens.

² 10 specimens.

³ 16 specimens.

Remarks. Unlike most fossil birds, which ordinarily are represented by single fragments, many remains of *Bathornis celeripes* have been obtained. In addition to the type metatarsus the collection now at hand includes one other metatarsus that is nearly complete, with many other fragments, including forty-four specimens of the distal end of the bone and eighteen of the head, the former being in the main in excellent condition. This material has been useful in checking characters and in providing measurements. The series exhibits a uniform appearance as regards form, and shows ordinary variation in dimension, this difference possibly being sexual in part.

There are in addition sixty-five specimens of the distal end of the tibio-tarsus (figs. 12-13) with more or less of the shaft of the bone



Figs. 12-13. Posterior face and lower articular surface of distal end of tibiotarsus of *Bathornis celeripes*, natural size.

attached. Though some of these have been distorted by crushing many of them have the condyles complete and in proper form. Following is description of pertinent characters evident in these specimens; outline of external condyle, viewed laterally, rounded anteriorly and flattened on distal margin, which joins posterior surface at rather an abrupt angle; external surface with margins raised, the posterior portion flaring out as a compressed, platelike process; outer face of internal condyle with anterior portion narrowed and projected forward considerably beyond level of shaft, the margins rounded, lower margin flattened and posterior margin protruded as a thin, raised plate; a rounded tubercle near level of anterior margin of shaft about equidistant from upper and lower margins with a shallow, rounded excavation in front; intercondylar fossa broad and deeply impressed, with the internal condyle rising abruptly from it, the margin of this condyle being thickened somewhat to produce a slight notch; boundary wall of

external condyle sloping outward at an angle of forty-five degrees; articular surface with raised margins bounding an angular sulcus; tendinal bridge (for extensor digitorum communis tendon) strong and heavy, with lip of lower margin projecting prominently, and another projection on external margin of bridge; a broad groove leading into this bridge; shaft somewhat slender, flattened on anterior surface, and rounded behind. Transverse breadth across condyles 12.5-14.8 (13.8),¹ anterior-posterior diameter of inner condyle 13.5-15.5 (14.2),²

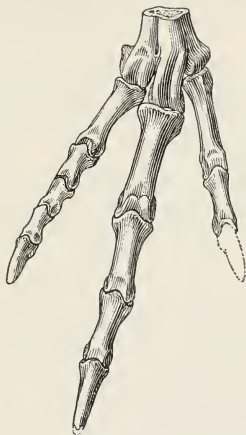


Fig. 14. Articulated foot with distal end of metatarsus of *Bathornis celeripes*, natural size.

of outer condyle 12.0-14.3 (12.7),³ smallest transverse diameter of shaft, 6.8-8.1 (7.2)⁴ mm.

There are present also the heads of three tibio-tarsi, much distorted by crushing that appear to belong to this species. They are similar so far as may be ascertained to *Bathornis cursor*, being proportionately smaller. The general appearance of the tibio-tarsus is that of *Cariama*.

In one of the slabs containing avian fossils there was found the distal end of a right metatarsus with the toes articulated (fig. 14), the

¹ 19 specimens.

² 15 specimens.

³ 18 specimens.

⁴ 8 specimens.

phalanges being complete except for the unguis of the second toe. This specimen is one of the most important in the series since it is this that demonstrates the relationship of *Bathornis* with *Cariama*, a fact that while indicated from other portions of the skeleton, from them alone does not seem to be absolutely certain. In this foot the end of the second phalanx of the second toe extends barely beyond the base of the second phalanx of the middle toe. In the fourth or outer toe the penultimate phalanx does not extend to the distal end of the second phalanx of the middle toe, and the second to the fourth phalanges are individually much shortened. In all these characters the fossil resembles *Cariama*.

The Oedienemidae (*Oedienemus* and *Burhinus*) have the end of the second phalanx of the second toe reaching nearly to the middle of the second phalanx of the middle toe, and the distal end of the fourth phalanx of the fourth toe reaching nearly to the middle of the third phalanx of the middle toe.

The second toe of *Bathornis ecleripes* (without the unguis) measures 27.3 mm., the third toe (with unguis) 55.9 mm., and the fourth toe (with unguis) 39.5 mm. Many disassociated phalanges are present in the collection.

In connection with this long array of specimens from the Torrington deposits it is of interest to record a find of *Bathornis ecleripes* in another locality. In the collections of the U. S. National Museum (Division of Vertebrate Paleontology Cat. no. 12,974) there is the distal end of a right tibio-tarsus obtained on the Everson Ranch twelve miles northwest of Crawford, Nebraska in the Oreodon beds of the Oligocene. The locality is approximately 60 miles northeast of the Torrington locality. The bone, in excellent condition, not being distorted as is the case with so many of the bones from Torrington, was collected on July 16, 1932 by M. V. Walker, working under direction of C. W. Gilmore of the National Museum.

This specimen in its conformation is identical with bones from Torrington, being in fair condition except in the region of the supratendinal bridge where it is imperfect. In size it is very slightly less than the smallest of the Torrington series now at hand but the difference is slight and is considered an individual aberration. Measurements are as follows: Transverse breadth across condyles 11.9 mm., anterior-posterior diameter of inner condyle 12.7 mm., of outer condyle 11.5 mm. The remnant of the shaft is too short to afford a comparative measurement.

Considering the abundance of remains from the lower limb the small

number of bones discovered that come from the wing seems strange. There is one fragment from the distal end of a right humerus that is taken to represent the present species, but that is in such condition that it tells little of the story that it should carry. The portion of the shaft present is more or less crushed and broken so that though the brachial depression is well indicated its proper shape is uncertain. The bone in general has resemblance to the humerus in *Cariama* but is slightly smaller with relatively smaller condyles. The ulnar condyle is partly missing and there is other evidence of artificial deformation during fossilization so that little more may be said regarding it and no detailed description is attempted.

Of greater importance are four fragmentary metacarpals that also may be compared with *Cariama*. All four are from the left side, one being reasonably complete except for the slender fourth metacarpal element, another lacking in addition a part of the proximal end, a third nearly complete but partly crushed, and a fourth consisting of the proximal end alone. The general form is reminiscent of that of *Cariama* but there are important differences to be noted. The proximal articular surface in the fossil has about the same outline, but is much more prolonged on the lower margin, the ridge of carpals 4 and 5 being continued forward past the level of the articular facet for the pollex. The fourth metacarpal so far as may be told from the ends that remain was flattened from above downward, without the downward curve and the produced, platelike form seen in *Cariama*. The second metacarpal is stronger and heavier with the proximal end more produced. The shaft of the third metacarpal is strong and heavy resembling *Cariama* with the tuberculum ulnare less produced. The most perfect specimen measures 54.2 mm. long, with the perpendicular diameter through the head 16.2 mm., and through the distal end 11.7 mm.

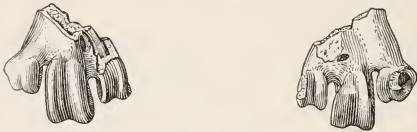
The general indication is of a relatively longer wing than in *Cariama* with the probability that *Bathornis celeripes* was a form that used its wings regularly in flight.

From the abundance of its remains *Bathornis celeripes* must have been very common. It was evidently a ground-inhabiting species, with relatively shorter legs than the modern *cariama* but a form of stronger flight. From its relative abundance it is probable that it was gregarious, perhaps somewhat as the sand-grouse are today. As the deposits from which it comes are extensive it may be expected that further parts of the skeleton will be found.

BATHORNIS CURSOR, new species

Characters. Metatarsus in form like that of *Bathornis celeripes* Wetmore but decidedly larger; similar to *Bathornis veredus* Wetmore¹ but somewhat smaller, with middle and outer trochlea relatively smaller and the external trochlea relatively heavier.

Description. Type, distal end of left metatarsus (figs. 15-19), Mus. Comp. Zoöl. Cat. no. 2236, from Upper Oligocene deposits four miles from Torrington, Goshen County, Wyoming, collected by Erich M.



Figs. 15-16. Two views of type of *Bathornis cursor*, natural size.

Schlaikjer. Lower end of shaft compressed and flattened transversely so that the bases of the trochlea are nearly in the same transverse plane; inferior foramen moderate in size, located in a deeply impressed groove that continues into the inter-trochlear sulcus; external trochlea compressed laterally, with the outer and inner faces nearly parallel, both being considerably excavated; articular surface shallowly grooved entirely around; external posterior margin produced as a narrow, backward projecting plate (partly broken away in this specimen), distal margin extending to two-thirds the height of the middle trochlea, the trochlea swung somewhat backward; middle trochlea with parallel sides which are deeply excavated, the margins on the posterior face approaching one another as they rise to merge in the shaft; a shallow median groove entirely around articular surface; internal trochlea block-like with broadened base and narrow extremity, inner and outer surfaces being deeply excavated; articular surface grooved completely around; a small, projecting plate on outer posterior margin (partly broken away); the trochlea relatively small and swung somewhat posterior to the transverse line of the middle trochlea, extending distally to center of middle trochlea. Color dull ivory white, strongly fossilized.

Measurements. Greatest transverse breadth across trochlea 20.1 mm. (Other pertinent measurements not available from type.)

¹ *Bathornis veredus* Wetmore, Proc. Colorado Mus. Nat. Hist., vol. 7, no. 2, 1927, p. 11, figs. 19-23, Chadron Oligocene, Weld County, Colorado.

Remarks. The type of this species is nearly as large as *Bathornis veredus* from the lower deposits of the Oligocene, differing in form in the lighter development of the trochlea. In general appearance *cursor* is a large edition of *Bathornis celeripes* from the same deposits.

In addition to the type there are several fragmentary bones that are identified as belonging to this same species.



Figs. 17-19. Three views of type of *Bathornis cursor*, natural size.

The head of a left tibio-tarsus somewhat crushed, is suggestive of *Cariama* except that the internal surface is not quite so deeply excavated.

A right femur is nearly complete but has been considerably crushed. While generally similar to *Cariama* it is more slender and more gracefully formed, and is also longer, a part but not all of this appearance of greater length being due to crushing. It measures 103.7 mm. in length. While its general characters have been preserved they have been somewhat modified and so are not described. The collection includes also the distal ends of three left and one right femora.

There are present also three phalanges from the middle toe including one basal segment and two second phalanges, as well as an ungual phalanx.

Representation of a large and a small species of *Bathornis* in the same deposits is of considerable interest. The larger form seems to have been about twice the size of the smaller, and judging from the relative number of specimens known was less abundant.

Following are the three species at present known in the family Bathornithidae.

Bathornis veredus Wetmore, Chadron formation, Weld County, Colorado, and Titanotherium beds, near Crawford, Nebraska.

Bathornis celeripes Wetmore, Upper Oligocene, Torrington, Wyoming.

Bathornis cursor Wetmore, Upper Oligocene, Torrington, Wyoming.

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HOWLER MONKEYS OF THE *PALLIATA* GROUP

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No. 8.— *Howler Monkeys of the palliata Group*

BY BARBARA LAWRENCE

INTRODUCTION

Last winter the Museum of Comparative Zoölogy received several specimens of a howler monkey from Herrera Province in Panama, that could not be satisfactorily identified until there had been a general revision of the group as a whole. The available material was, therefore, assembled from all of the larger museums in the country and a careful study made of a series of skins and skulls numbering some 174 specimens. Shade and distribution of color, length and texture of the hair, and size were carefully noted in all of the individuals observed. Skull measurements were taken, checked, and then reduced to ratios using the total length as a common dividend. This was done in order to make the measurements comparable regardless of size differences due to age. Deformed and badly broken skulls were, of course, not used. It became apparent as soon as work was started on this group that the range of individual variation is exceedingly great; coupled with this there is a marked similarity among individuals taken at the same time in the same place and so, presumably, out of the same band. Dr. Ray Carpenter, who has spent considerable time in Panama studying the habits of these monkeys, writes me that from actual field observations he, also, has found this to be true. Further, he says that although howler bands are not closed societies, "females and to a high degree males of a group remain in rather constant association"; solitary males may break off and later join with some other band, bringing about interbreeding between troops without, however, obviating the fact that there is a certain common genetic background for individuals of each band. This, I believe, is particularly important from a taxonomic standpoint; great care must be exercised not to give undue weight to traits that are merely local family differences, for this would lead to a ridiculous and wholly unwarranted number of subspecies each limited to a very small area. The problem is further complicated by the appearance of occasional individuals in almost every part of the total range that differ from their nearer representatives but are very similar to others found at some point far removed geographically. Only when the extremes of each area are very different and the average form is quite distinct have I considered it justifiable to subdivide the typical form. Unless each small local race is given separate recognition, this is the only practical method of dealing with the group. External measurements of fresh specimens were not available in all cases, and where they could be obtained were not

strictly comparable as they were taken by a number of different people. Although I have used these to a certain extent as an index of size, I have emphasized more especially differences in skull size. The manner in which cranial measurements were taken is explained in detail below. Names of colors in quotation marks are always after Ridgway, "Nomenclature of Color for Naturalists," 1886.

I have made no attempt to deal with the habits and life history of these monkeys, as Dr. Carpenter is preparing a very comprehensive study of this field. The distribution of the species as a whole is very widespread in the forested areas extending from the southern part of the state of Vera Cruz in Mexico into Ecuador. The most southerly example that I have examined comes from El Chiral south of the Gulf of Guayaquil. Detailed distribution I have considered separately for each subspecies. The range in altitude at which they may be found is governed principally by the occurrence of suitable forest growth.

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Explanation of cranial measurements

In studying the skulls of this species the following measurements were taken in millimeters:

Greatest length.—Length from the occipital projection to henselion, the most anterior point of the palate at the inner base of the incisors.

Condyllo-basilar length.—Length from condylion, the most posterior point on the occipital condyle, to henselion.

Basilar length.—Length from basion, the most anterior point of the foramen magnum, to henselion.

Palatal length.—Length from palation, the most anterior lateral point on the posterior margin of the palate, to henselion.

Length of rostrum.—Minimum length from the lower border of the orbit to gnathion.

Zygomatic width.—Maximum width across the zygomatic arches.

Mastoid width.—Width across the mastoid bones directly above the center of the auditory meatus.

Width of braincase.—Maximum width across the braincase.

Width outside molars.—Maximum width of the molar series taken across the crowns.

Upper cheek teeth.—Total length of the upper cheek teeth from the most anterior point on the canines to the posterior border of the third molar.

Lower cheek teeth.—Total length of the lower cheek teeth from the most anterior point on the canines to the posterior border of the third molar.

Length of first premolar.—Maximum length of the first premolar taken antero-posteriorly on the outer margin of the tooth.

Width of first premolar.—Maximum width of the first premolar taken across the crown.

As many of the skulls examined had lost their incisors, all of the total length measurements were taken exclusive of these teeth. Unless otherwise stated all measurements not in the mid-line were taken on the left side of the skull. A full table of the measurements, grouped according to localities may be found on the last pages of the paper. As explained above, all of the measurements were reduced to ratios, using the total length as a common dividend; the more significant of these together with the average for each group are inserted immediately following the description of each subspecies. Certain traits that are not very readily demonstrable by measurements as skull ridges, the shape of the audital bullae, the shape of the interpterygoid fossa, and the position of the hamular processes of the pterygoids have been noted separately.

ALOUATTA PALLIATA PALLIATA (Gray)

Myctes palliatus Gray, Proc. Zoöl. Soc. London, 1848, p. 138, pl. 6; Wagner, Schreber, Säugeth., Suppl., 5, 1855, p. 71; Reichenbach, Vollstand. Naturg. d.

Affen, 1862, p. 70; Frantzius, Archiv f. Naturg., **35**, 1869, p. 254; Gray, Cat. Monkeys, Lemurs and Fruit-eating Bats, Brit. Mus., 1870, p. 40; Selater, Proc. Zoöl. Soc. London, 1872, p. 7; Schlegel, Mus. des Pays-Bas (Leyden Museum), Simiae, 1876, p. 152; Alston, Biol. Centr.-Amer., **1**, Mamm., 1879, p. 4; True, Proc. U. S. Nat. Mus., **7**, 1884 [1885], p. 611; Forbes, Handbook Primates, **1**, 1894, p. 202.

Alouata palliata Trouessart, Catal. Mamm. viv. foss., 1897, p. 34.

Alouatta palliata Elliot, Publ. Field Columb. Mus., Zoöl. Ser., **4**, Pt. 2, 1904, p. 726, fig. 138; Id. Publ. Field Columb. Mus., Zoöl. Ser., **6**, 1905, p. 533; Id. Publ. Field Columb. Mus., Zoöl. Ser., **8**, 1906, p. 555, pl. 81; Elliot, Mon. Ser. Am. Mus. Nat. Hist., **1**, 1912 [1913], p. 271.

Alouatta palliata matagalpae Allen, Bull. Am. Mus. Nat. Hist., **24**, 1908, p. 670.

Type specimen. Originally described by Gray from a specimen sent to him by Sallé, supposedly from Caracas, Venezuela. Sallé later stated to Selater that he had procured the specimen on the shores of Lake Nicaragua, so this becomes the type locality, and *Alouatta palliata matagalpae* a synonym. The type as described by Gray probably has a greater proportion of light-colored hairs on the sides than is average for the typical subspecies. No cranial measurements are given.

Description. Size large, general color black with light flank hairs, face black and naked with a pronounced beard in the males. Skull short, broad; braincase flattened, hardly projecting above the level of the orbits; angle of the mandibles tremendously enlarged.

The color of these howler monkeys is extremely varied. Typically they are quite dark with the head, shoulders, and limbs almost black; in certain lights they take on a slight brownish tinge. The flank hairs are "cinnamon-rufous," with the bases only slightly paler and the tips dark "walnut." These flank hairs extend from the groin to the armpit and are most pronounced posteriorly. In the lower dorsal region they mingle gradually with a few light-banded hairs; these are not very numerous, have "walnut" bases, dark tips, and a narrow band of "cinnamon-rufous" immediately below the tip. A few of them may be scattered along the sides well anteriorly but the central dorsal region is usually quite free of them. Variation from this coloring is somewhat extreme in both directions. I have one individual from Costa Rica that is entirely black and another from Coto in Panama that has the head, shoulders, limbs and tail very dark "walnut" to black, the flanks with a mantle of bright, golden "orange rufous," the bases of the hairs silvery "buff yellow," and the tips "walnut" of a not very intense shade. These flank hairs extend in a wide fringe from the groin to the armpit.

The lower part of the back is covered with hairs tipped with dark "cinnamon rufous," the bases of these hairs are buffy and there is a narrow strip of dark "walnut" just above the base; about half way up the back the bases of the hairs become pale "walnut," and the tips darker until there is only a very small ring of "cinnamon" or "orange rufous" left. These hairs mingle gradually with those that are completely dark until on the fore part of the back and the shoulders there are no light-banded hairs at all. On the inner margin of the hind legs there is a very slight tinge of dark "cinnamon rufous." Although this is the most brilliant example of *A. p. palliata* that I have examined, the type and a topotype of J. A. Allen's *A. p. matagalpae* are almost as bright with the rump only slightly darker and the extent of the mantle somewhat reduced. Some of *A. p. palliata*, again, have the mantle silvery "chrome yellow" without any appreciable red pigment, others, over the whole back, have the bases of the hair very pale with the dark tips just long enough to give the animal a black appearance. This occurs generally where the light mantle is reduced.

Skull. Members of this group have a short, broad, and somewhat massive skull. The zygomatic arches are short and rather squarely spreading, ending posteriorly in a pronounced ridge over the auditory meatus. The brow ridges, the temporal ridges, and the ridge along the occipital suture are all prominent. The braincase is short and broad, generally slightly depressed between the orbits, and flares somewhat posteriorly from a marked constriction in the temporal region. There is generally a definite angle where the frontal profile rises from the rostrum which is moderately long in proportion to the braincase. The nasal bones are narrow and slightly flaring anteriorly. The interorbital space is narrowest across the upper portion of the inner margin of the orbits on a line about parallel with nasion. The audital bullae are rounded, and only moderately bulging. The sides of the interpterygoid fossa are rounded and approach each other most closely at the extreme posterior end. The palate is U-shaped, and in general parallel-sided. Proportionally the molars are large, while the premolars, especially the first, are considerably smaller. In the male, particularly, the canines are enlarged, the lower incisors are vertical and the upper ones are proclivous. Males also have the tremendously enlarged angle of the mandible to protect the large hyoid bones, typical of the genus. Skulls of the females are very easily distinguished from those of the males by the absence of this feature. They are smaller and lighter with none of the ridges so pronounced as in the male.

Remarks. Although this monkey appears very early in the literature

of Central American mammals, no extensive analysis of its distinguishing traits and of its range seems to be available. The original description of *Myectes palliatus*, containing no mention of skull features, is as follows: "Black brown; hair of the middle of the back and upper part of the sides yellow brown, with black tips; of the lower part of the sides elongate brownish yellow forming a kind of mantle on each side" (Gray, 1848). Dr. von Frantzius in 1869 compares certain individuals that he collected in Costa Rica with Gray's description of *Myectes palliatus*, and states that the Costa Rican form is "black" rather than "black brown" of Gray, that the golden hairs are found only on the undersides and the shoulders, and that the coloring of the male, female and young is very similar. In spite of the color differences between his animals and Gray's, however, he agrees with Peters in calling his specimens *palliatus*. The earliest reference that I have been able to find to the error made in the type locality of this form is in Sclater's paper in 1861: "a *Myectes* described and figured by Dr. Gray in the Proceedings of the Zoölogical Society for 1848 under the name *M. palliatus*, and erroneously stated to be from Caraccas." Later, in 1872, he explains that M. Sallé, who procured the type and some other specimens, told him that they came from Nicaragua where they occur on the islands and banks of the lake. The correction in type locality is on good evidence, and I believe should be allowed to stand. The possibility of a very wide range in color variation was first noted by Schlegel in 1876: "Je ne crois pas qu'il existe des différences constantes dans les teintes de l'espèce, suivant les localités." Although he recognizes that von Frantzius' monkeys from Costa Rica might be darker than Gray's type, he claims that the wide range of color variation in the seven Panama examples that he personally examined bears out his theory that these differences are merely individual traits. It is very likely that the specimens which he actually studied were *A. p. aequatorialis*, nevertheless his conclusions in this matter are probably quite accurate and equally applicable to both forms. Alston in 1879, summing up the work done on *Myectes palliatus*, states that some of the Panama howler monkeys are as dark as the Costa Rican ones while some are as light as the Nicaraguan type and concludes: "I must therefore agree in Prof. Schlegel's conclusion that the variation does not depend on locality." The synonymy of this form includes *A. p. matagalpae* J. A. Allen, which was described in 1908 from two specimens collected in 1907 at Savalá, Matagalpa, Nicaragua. When Allen named this form, he was unaware of the true type locality of *A. p. palliata*. He characterized it as being similar in size to *A. p. palliata*.

and *A. p. mexicana*, and as having flank stripes "dark rufous instead of pale rufous or golden (*palliata*) or pale fulvous or grayish fulvous (*mexicana*); suffusion of back dark rufous instead of fulvous or grayish fulvous." On recognition of Nicaragua instead of Caracas as the type locality for *A. p. palliata*, it becomes clear that *A. p. matagalpae* is identical with Gray's animal.

The subspecific division of *Alouatta palliata* has been difficult; for aside from a few very marked forms, as the one from Coiba Island and the two from Guatemala, individual differences in a given area have been so numerous as almost to coincide with the variation over the total range of this species. *A. p. mexicana* may be distinguished principally on the basis of certain skull characters; the three remaining forms are, however, dependent more especially on differences in shade and distribution of color. It has been most difficult to separate *A. p. aequatorialis* from typical *A. p. palliata*, because in the region of Panama there is so much intergradation between the two forms. Though very similar individuals with much reduced light markings are occasionally found over most of the range of the species, the extremes of variation are totally different. This is particularly interesting, as these extremes are not isolated forms but individuals from a series in which there may be all degrees of coloration leading up to the extreme form. I have described in detail the pigmentation of the brightest individuals of *A. p. palliata* and this may be compared with the much yellower Ecuadorean extreme, where the whole general ground color is markedly browner and the "ochraceous" coloring of the flanks extends far down on to the hind limbs. In general the even ticking of light-banded hairs over the back without such a marked concentration in the posterior region, the absence of any "orange rufous," and the presence of a few light hairs scattered over the tail, very often concentrated at the tip, are quite characteristic of *A. p. aequatorialis*. Further, the rostrum is slightly shorter and the occipital projection somewhat more pronounced.

Geographical distribution. The typical form of *A. p. palliata* is found from the extreme western part of Panama north through Costa Rica, Nicaragua, and Honduras. In the south it merges gradually with *A. p. aequatorialis*, making the individuals from Panama quite intermediate. The most northern specimens that I have examined come from Honduras near the Guatemalan border and are typical *A. p. palliata*; intergradation between these and the Mexican and black Guatemalan forms probably takes place farther north.

Specimens examined. In all, 46, as follows:

Panama, Coto, one female, skin and skull;

Costa Rica, Talamanca, eight males, three skin and skull, two skin only, three skull only, eleven females, two skin and skull, one skin only, eight skull only; Guayabo, two females, skin and skull; no locality, three males, two skin and skull, one skull only, three females, skull only;

Nicaragua, Matagalpa, five males, skin and skull (including type of *matagalpae*); Peña Blanca, one male, skin and skull;

Honduras, Chamelicon, one male, skin only; Segovia R. one male, skin only, one female, skin only; eastern part, one male, skull only, three females, skull only; San Pedro, one male, skin and skull, one female, skin and skull.

Skull ratios					
<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.73-3.00	2.84
"	"	"	" length of upper cheek		
			teeth	2.60-2.84	2.69
"	"	"	" length of rostrum	3.17-3.45	3.29
"	"	"	" zygomatic width	1.32-1.46	1.39
"	"	"	" mastoid width	1.91-2.11	2.00
"	"	"	" width outside molars	2.68-3.09	2.87
"	"	"	" width of cranium	2.02-2.25	2.15
<i>Female</i>					
"	"	"	" palatal length	2.73-3.03	2.84
"	"	"	" length of upper cheek		
			teeth	2.55-2.81	2.68
"	"	"	" length of rostrum	3.33-3.67	3.46
"	"	"	" zygomatic width	1.39-1.52	1.45
"	"	"	" mastoid width	1.93-2.08	2.01
"	"	"	" width outside molars	2.73-3.00	2.87
"	"	"	" width of cranium	1.97-2.21	2.10

ALOUATTA PALLIATA AEQUATORIALIS Festa

Alouata aequatorialis Festa, Boll. Mus. di Zoöl. ed Anat. Comp. d. Univ. d. Torino, 18, 11 Feb. 1903, p. 3. Elliot, Mon. Ser. Am. Mus. Nat. Hist., 1, 1912 [1913], p. 274.

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Alouatta palliata Allen, Bull. Am. Mus. Nat. Hist., **20**, 1904, p. 79; Elliot, Publ. Field Columb. Mus., Zool. Ser., **8**, 1907, p. 555, pl. 81.

Alouatta inclamax Thomas, Ann. Mag. Nat. Hist., Ser. 8, **12**, Dec. 1913, p. 567.

Alouatta palliata quichua Thomas, Ann. Mag. Nat. Hist., Ser. 8, **12**, Dec. 1913, p. 567.

Alouatta palliata inconsonans Goldman, Smithsonian Miscell. Coll., **60**, Feb. 28, 1913, p. 17; Ibid., **69**, 1920, p. 229.

Type specimen. Described from four cotypes, two adult males, one female and one young, skins numbers 101, 102, 103, and 104, and skulls numbers 4688, 4886, 4692, and 4693, Mus. di Zoölogia ed Anat. Comparata della Università di Torino, from Vinces, Ecuador; collected in September, sometime between 1895 and 1898, by Enrico Festa. *Alouata aequatorialis* was suggested by Festa for his four specimens in the event that they should prove distinct from *Alouata nigra*.

Description. General color black to dark mummy-brown, with the mantle hairs, which are slightly shorter than in *A. p. palliata*, golden "ochraceous"; the back is evenly sprinkled with a varying number of light-tipped hairs, and there is a slight scattering of light-tipped hairs on the tail especially on the under surface; very often they are concentrated at the posterior end. The range of color variation in this subspecies is notably great; the brightest-colored individuals have the head, shoulders, and arms dark "mummy brown" with the bases of the hairs "walnut." The flank hairs, which are golden "ochraceous" with the bases slightly paler, are most numerous posteriorly and hardly extend as far forward as the axillary region. The rump, tail, and lower part of the hind legs are a paler shade of "mummy-brown" than is the anterior part of the body, and the bases of the hairs are brownish "buff." The inner margins of the hind legs are golden "ochraceous" as far down as the knee, while on the outer margin the hairs are darker but with a marked golden tinge at the tips. Hairs with much reduced light bands are plentifully sprinkled over almost all of the back. This extreme form of coloring differs markedly from that found in *A. p. palliata*. The ground color is a much paler, more golden brown, the flank hairs are "ochraceous" rather than "orange rufous," and this bright coloring extends much farther down on the hind limbs. From this extreme there are all degrees of coloring to almost pure black; the brown on the limbs is exceptional rather than usual, most of the specimens being quite black. Even in dark individuals there is usually a sprinkling of light hairs on the under sur-

face of the tail with a marked concentration at the tip. It is noticeable that even where the bright mantle is almost totally absent the back is still more or less profusely sprinkled with hairs banded with buffy "ochraceous" and there is little tendency for these to concentrate posteriorly as in *A. p. palliata*. These two traits are particularly important in setting this subspecies apart from *A. p. palliata*. In individuals where the mantle is not very pronounced, it is much less golden and tends toward buffy, which together with its shorter length helps to separate this form quite definitely from *A. p. trabeata*.

Skull. The skulls of this race are so similar to those of *A. p. palliata* that it would be impossible to separate the two forms on the basis of skull characters alone. The rostrum is slightly shorter in proportion to the total length and to the length of the braincase and the proportional width across the zygomatic arches is slightly broader than in *A. p. palliata*; the former character is most noticeable in male skulls. There is a tendency even in young skulls for the lateral ridges to meet in a sagittal crest, and to have a pronounced triangular occipital projection. Otherwise in size, general shape and proportions, their ranges of variation are mutually inclusive. The widely separated extremes in the female's ratios of length of upper cheek teeth to total length in *A. p. aequatorialis* both came from Panama, the lowest from Citrus and the highest from the Canal Zone.

Remarks. The first published description of an Ecuadorean howler monkey was that of Thomas in 1880 who refers his specimen to *Myctes niger*, the black howler of Paraguay, which Elliot in "A Review of the Primates" (1913) considers as synonymous with *Alouatta caraya*. Thomas's specimen came from Intac about 50 miles north of Quito. At the time when he first examined it, the sex of the animal was undeterminable, and in general appearance it seemed to agree quite closely with Humboldt's original description of the female of *Simia caraya*,—head and back black, sides yellow. He further compares the Intac form with *A. p. palliata* and goes on to say that: "*Myctes palliatus*, to which this specimen bears a certain resemblance, is found only in Central America and differs in the length of the hairs and in the detailed distribution of the colours." In 1903 in a detailed account of the four specimens from which he described *A. aequatorialis*, Festa emphasizes their general chocolate-brown color with the bases of the hairs yellowish fulvous, the tips yellow, and the flanks golden yellow. The females, he says, are browner with less golden than the males. Compared with *A. nigra* he says that they differ in being chocolate rather than black. Although Thomas's specimen from Intac is blacker

than his, Festa believes that it should belong to the same species and hence calls his *A. nigra*. He does, however, call attention to the necessity of having more specimens before a final determination can be made and proposes *A. aequatorialis* if it should turn out to be different. In 1913 the Intac specimen was made over and it became obvious that it was a male, so Thomas redescribed it, this time calling it *A. inclamar*, sp. n. "General colour black. Under surface mixed black and buffy, the inconspicuous lateral mantle cream-buff. Hands mixed black and buffy. Thighs black along their antero-external edge only, their hinder and lower sides conspicuously buffy, contrasting strongly with the general black colour. Lower legs blackish all around; feet mixed black and buffy. Tail black for three-fourths its length above, its under surface and terminal fourth whitish buffy." He does not compare it with *A. p. palliata*, but states that the yellowish thighs set it apart from *A. caraya* and *A. villosa*. He distinguishes it from *A. aequatorialis* on the ground that Festa's form was "chocolate brown" rather than "black." In the same paper Thomas describes another howler monkey, *A. p. quichua* from the Rio Blanco 20 miles west of Mindo, Ecuador. This he considers to be a southern form of *A. palliata*. In contrasting this form with the Central American one, he notes: "Posterior back finely ticked with buffy, the hairs commonly black with buffy (ochraceous buffy) tips," and the "tail with many of its hairs buffy, especially towards its tip." Both of these points I have found to be distinctive features of *A. p. aequatorialis*. Comparing the skull of *A. p. quichua* with that of *A. p. palliata* he says that the "mesopterygoid fossa is more squarely open anteriorly and the zygomata are less broadened vertically, especially in their anterior part." These traits I have found to be extremely variable, and the latter particularly is dependent almost entirely on the age of the individual, so that neither of them is really good for purposes of classification. A further difference that he mentions and which does not seem to hold when large series of both animals are studied is that those from Central America are "buffy-sided" whereas the Ecuadorean ones are more "tawny-mantled." More accurately, the difference in coloring of the lateral hairs is that in *A. p. palliata* they have considerably more red pigment and therefore are more "orange rufous" than in *A. p. aequatorialis*. The two forms that Thomas describes come from places that are relatively close together, and as they fall well within the range of variation for *A. p. aequatorialis*, I think that they may undoubtedly be considered as synonymous. The Panama form, *A. p. inconsonans*, which Goldman described in 1913, may also be considered as synony-

mous with *A. p. aequatorialis* although in many ways it seems to be intermediate between this and *A. p. palliata*. Topotypes of Goldman's subspecies from Cerro Azul resemble quite closely the Ecuadorean monkey, their general coloring ranging from all black to black with the back evenly suffused with light-banded hairs; the light mantle, when present, is very limited in extent and may be of almost any shade from "walnut" to brownish "ochraceous." Other specimens from the Rio Chucunaque are almost entirely black with the few scattered mantle hairs in some cases distinctly reddish. Canal Zone specimens, also, are all quite dark with a tendency toward a general scattering of light-banded hairs over the back, the paler mantle hairs are reduced and vary from a preponderance of yellow to one of red pigment. Specimens from all of these localities seem to link the Panamanian animal with the more southerly one, and this division would be quite clear were it not for a few aberrant individuals scattered over this same area. Thus from the Madranal River I have one specimen that is almost as golden as the Herrera howlers with the pigment distributed in a very similar manner, and from the Atrato River in Colombia I have two that are very like those from Costa Rica. Again, a series from the north of Panama around Boquete and Boqueron range from those having a mantle of pale "ochraceous" with the whole back profusely sprinkled with light-banded hairs to others in which the mantle is much more "walnut" and the light-tipped hairs, limited to the lower dorsal region, are much redder at the tips. This series is perhaps the most intermediate of them all. The even diffusion of light-banded hairs over the back in the majority of them, however, leads me to consider them as *A. p. aequatorialis*; yet a single specimen from the coast at the mouth of the river Coto very near this area seems more nearly to approximate *A. p. palliata*. In general the skulls of the Panamanian animals are not as distinct from those of *A. p. palliata* as are the Ecuadorean ones; but this was to be expected considering their intermediate position.

Geographical distribution. This form extends from the southern limit of distribution of *A. p. palliata* in western Panama through the rest of Panama and down along the Pacific coast of South America through Colombia and Ecuador to the region south of the bay of Guayaquil. It is not, however, a strictly coastal form but is found as far inland as the region around Mindo in Ecuador.

Specimens examined. In all, 36, as follows:

Ecuador, Cerro Manglar Alto, near the town of Manglar Alto, three males, skin and skull, four females, skin and skull; Cuaque, river

near Pedernales, one male, skin and skull, one female, skin and skull; El Chiral, Prov. del Oro, one female, skin and skull; Mindo, one male, skin only, two female, one skin and skull, one skull only; Vinces on the R. Vinces which empties into the northern part of the Gulf of Guayaquil, four males, three skin and skull, one skull only, three females, two skin and skull, one skull only; Cerro Bajo Verde, one male, skin and skull, one female, skin and skull;

Colombia, Atrato R., two males, skin only, one female, skull only;

Panama, Tacarcuna, one male, skin and skull; Tapalisa, two male, skin and skull; Cituro, one female, skin and skull; Rio Chucunaque, five males, four skin and skull, one skull only, three females, two skin and skull, one skull only; Cerro Azul, one male, skin and skull, six females, skin and skull, one immature female, skin and skull (topotypes of *inconsonans*); Maxim Ranch (probably the Maxon Ranch on the Rio Trinidad in Bocas del Toro), one male, skull only; Canal Zone, near Gatun Lake, two males, one skin only, one skull only, six females, four skin only, two skull only; Canal Zone, two males, one skin and skull, one skull only, three skin only, sex undetermined; Boquete, three males, two skin and skull, one skull only, seven females, five skin and skull, two skull only, two immature females, skin and skull; Boqueron, one female skin and skull; Bocas del Toro, one male, skull only.

Skull ratios

<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.66-3.07	2.82
"	"	"	" length of upper cheek teeth	2.58-2.86	2.69
"	"	"	" length of rostrum	3.15-3.55	3.31
"	"	"	" zygomatic width	1.33-1.50	1.36
"	"	"	" mastoid width	1.91-2.11	1.99
"	"	"	" width outside molars	2.72-3.11	2.92
"	"	"	" width of cranium	2.02-2.37	2.16
<i>Female</i>					
"	"	"	" palatal length	2.71-3.08	2.88
"	"	"	" length of upper cheek teeth	2.32-2.95	2.63
"	"	"	" length of rostrum	3.26-3.72	3.50
"	"	"	" zygomatic width	1.30-1.51	1.43
"	"	"	" mastoid width	1.90-2.09	1.98
"	"	"	" width outside molars	2.63-2.98	2.81
"	"	"	" width of cranium	1.89-2.26	2.04

ALOUATTA PALLIATA TRABEATA subsp. nov.

Type. Adult male, skin and skull, no. 29545 Museum of Comparative Zoölogy, from Capina, Herrera Province, Panama, collected in March, 1933, by Dr. Thomas Barbour.

Description. This subspecies is most readily distinguished by the very golden appearance of the flanks and lower part of the back. The lateral mantle of long, golden, silky hairs extends in a wide fringe from the arm-pit to the groin, in some specimens a few golden hairs are also found on the outer margin of the upper arm. The tips of these mantle hairs are pale golden "ochraceous" while the bases are silvery. There is a large area on the lower flanks where no dark hairs are found; the progressive darkening of the hair toward the mid-dorsal region starts with the bases which change gradually from silver through light to deep "walnut." Toward the mid-dorsal region the golden "ochraceous" tip gradually shifts to a ring immediately below the tip while the actual tip is "walnut." The ring, in turn, becomes narrower and narrower allowing an increasing amount of the walnut base to show and thus giving the back a slightly darker appearance than the flanks. The distribution of brilliant coloring over the back varies somewhat in different specimens; in some cases it is continuous across the whole posterior region, while in others a narrow, dark streak may persist centrally. Its antero-posterior extent is also varied, generally the dark "walnut" hairs of the upper part of the body start across the shoulders and reach in a V-shape not quite halfway down the back. On the lower part of the back, and on the hind legs sometimes as far down as the feet, and sometimes on the upper part only, the hairs are ringed with dark "ferruginous" and that takes a very golden sheen in some lights; this marking is found to a lesser degree on the upper part of the fore limbs. The head, shoulders, upper part of the back, tail, and lower part of the limbs are all deep walnut. In most specimens the sides of the face below the ears are slightly paler than the rest of the head and in a few there are distinct, though small, golden "ochraceous" patches in this area. The ventral surface is sparsely covered with pale "walnut" hairs, and in some specimens on the posterior part of the belly the hair is the same golden "ochraceous" color as it is on the flanks.

Skull. The skull varies only slightly from that of typical *Alouatta palliata palliata*, and the differences are not very definite unless one has a fairly large series from which to work. There is a greater sexual difference in size among these monkeys than there is in others of this

species. This is especially noticeable when one compares total lengths. Skulls of males of *A. p. trabeata* average the same length as those of males of *A. p. palliata*, while those of females of the former are distinctly smaller than females of the latter. A study of the table of measurements will show that a large enough series of females was measured to establish this as a real difference rather than a casual variation of a few aberrant individuals. The palate and rostrum of *A. p. trabeata* are both slightly longer when compared with the total length of the skull, this difference is more noticeable in female than in male skulls. When total length is divided by palatal length, the resultant ratios range in the female from 2.71 through 2.86 with an average of 2.77; total length divided by length of rostrum gives a similar range of 3.25 through 3.45 with an average of 3.34. In male skulls the corresponding ratios are for the former 2.74 through 2.80 with an average of 2.77; and for the latter 3.17 through 3.22 with an average of 3.20. The teeth in this new form are of practically the same size as those of *A. p. palliata*, except the premolars of the males which are wider, more nearly approximating the width of the true molars, a difference especially marked in two of the three specimens measured.

Remarks. The distinction of this subspecies depends principally on the much greater distribution of golden "ochraceous" hair on the flanks and lumbar region, and the general browner color of the rest of the body. As color varies greatly in Central American monkeys, it was particularly important to obtain a large series from Herrera to determine whether this difference in color was really a consistent characteristic. Ten specimens were examined from different parts of this province and only one proved to be less golden than the most extreme forms found in the rest of Central America. On an average they were very much more golden than these others and the number of specimens from other areas that even approximated them in color was very limited; a female from the Madranal River somewhat south of the Canal Zone is every bit as golden as the Herrera ones, but unfortunately I have only one example from this locality, so cannot be quite certain whether this is, as I strongly suspect, an extreme individual. From Boqueron in the north of Panama I have a female that is almost as bright although the pigment is "orange rufous" rather than "ochraceous." A few specimens from Boquete have the bright mantle hairs distributed quite far anteriorly but they do not cover the lower region of the back to nearly as great an extent. From Ecuador, I examined one extremely yellow individual that is very similar to *A. p. trabeata*. The Herrera form may be distinguished from this one by its

general "walnut" rather than the "mummy brown" coloring. The bases of the hairs are darker, the tips redder, and the lateral mantle is longer and more golden anteriorly than is the case in *A. p. aequatorialis*. It is always a somewhat uncertain business to subdivide large mammals that have a potentially wide range. In this case, however, we are dealing with an isolated area of forest cut off from the rest of the range by a wide intervening strip of open country. Breeding with darker stock is thus quite effectively cut off, and the tendency will probably be for the distinctive characteristics of *A. p. trabeata* to become increasingly emphasized.

Geographical distribution. These monkeys are found only on the Azuero Peninsula in Panama. This is an isolated area separated from the range of typical *A. p. aequatorialis* by a wide strip of unforested land, so the ranges of these two forms are quite distinct.

Specimens examined. In all, nineteen specimens as follows:

Panama, Parita, one male, skin and skull, three females, skin and skull, one young skin and skull; near Parita, two males, skin and skull, three females, skin and skull, one immature female, skin and skull; Herrera Prov., one female, skull only, one young skull only; Capina, three males, skin and skull, three females, skin and skull.

				Skull ratios	
<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.74-2.80	2.77
"	"	"	" length of upper cheek		
			teeth	2.58-2.64	2.61
"	"	"	" length of rostrum	3.17-3.22	3.20
"	"	"	" zygomatic width	1.33-1.35	1.34
"	"	"	" mastoid width	1.96-2.06	2.01
"	"	"	" width outside molars	2.91-3.00	2.95
"	"	"	" width of cranium	2.01-2.13	2.09
<i>Female</i>					
"	"	"	" palatal length	2.71-2.86	2.77
"	"	"	" length of upper cheek		
			teeth	2.41-2.58	2.51
"	"	"	" length of rostrum	3.25-3.45	3.34
"	"	"	" zygomatic width	1.39-1.46	1.43
"	"	"	" mastoid width	1.84-2.07	1.99
"	"	"	" width outside molars	2.68-2.90	2.81
"	"	"	" width of cranium	1.92-2.09	2.00

ALOUATTA PALLIATA COIBENSIS Thomas

Alouatta palliata coibensis Thomas, Novitat. Zoöl., 9, 1902, p. 135; Elliot, Publ. Field Columb. Mus., Zoöl. Ser., 4, Pt. 2, 1904, p. 727; Id. Publ. Field Columb. Mus., Zoöl. Ser., 6, 1905, p. 533; Id. Publ. Field Columb. Mus., Zoöl. Ser., 8, 1906, p. 556; Elliot, Mon. Ser. Am. Mus. Nat. Hist., 1, 1912 [1913], p. 233; Goldman, Smiths. Misc. Coll., 69, April 24, 1920, p. 230.

Description. These monkeys are somewhat smaller and duller colored than typical *A. p. palliata*. The upper part of the back, the head, and the fore limbs are of such a dark shade of "seal brown" that in most lights they appear black; toward the lower part of the back this becomes paler, and in most specimens the rump and upper parts of the hind limbs are "walnut" with slightly more reddish tips to the hair. The bases of the hairs over most of the body are "walnut" of varying intensities, palest in the posterior region. The hair of the flanks is quite uniformly "orange rufous" to "cinnamon rufous," the bases are either silver or "walnut" and the tips are dark. These mantle hairs are most concentrated on the flanks immediately anterior to the hind legs, though in some individuals a few scattered hairs may extend as far forward as the armpits; they mix gradually with the dark hair on the back and their relative proportion varies considerably. Characteristically the whole lower dorsal region is dark "cinnamon rufous" to "chestnut," and the very reddish mantle, although it is often very extended, is never as bright as in the mainland form.

Skull. In all its proportions the skull is very similar to that of typical *A. p. palliata*. In actual dimensions, however, it is definitely smaller and lacks prominent ridges; there is no flattening of the cranium immediately back of the orbits; the braincase is more rounded, and the teeth, especially the premolars, are smaller.

Remarks. The notably smaller, lighter, skull with its smoothly rounded braincase and smaller teeth as well as the less brilliant, redder color of this howler are its most distinguishing characteristics. Dr. Ray Carpenter who has spent considerable time in Panama collecting and studying Central American howler monkeys, claims that this difference in size is not very marked, basing his conclusions principally on a comparison of the weights of some of these monkeys. Of the five skulls which I myself have examined, none is as large as those of the mainland form. All of them were fully adult, and three, two males and one female, were old with the teeth well worn and sutures completely closed so that it is quite certain they had attained their maximum growth. Thomas, who described the subspecies working with six

specimens, also notes, particularly, the difference in size. For this reason and because the color, also, is distinct, I am inclined to regard *A. p. coibensis* as a perfectly good race, although I do not think as does Goldman (1920), that the differences are sufficient to warrant its separation as a full species.

Although this form was not described until 1902, as early as 1879 a certain Captain Dow remarks on the presence of an island form off the coast of Veragua. "Mr. Salvin tells me that Captain Dow informed him that he once met with Howling Monkeys on the little island of Hicaron, which lies at the southern extremity of Quibo [Coiba] Island off the coast of Veragua. The species would probably be *Myctes palliatus*" (Alston, 1879).

Geographical distribution. This subspecies is found on Coiba Island, off the Pacific coast of Panama.

Specimens examined. Five males, three skin and skull, two skin only; four females, two skin and skull, two skin only; one skin, sex undetermined; all of them from Coiba Island.

				Skull ratios	
<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.79-2.80	2.80
"	"	"	" length of upper cheek teeth	2.49-2.61	2.56
"	"	"	" length of rostrum	3.18-3.39	3.28
"	"	"	" zygomatic width	1.28-1.38	1.33
"	"	"	" mastoid width	1.92-2.10	2.02
"	"	"	" width outside molars	2.70-2.99	2.83
"	"	"	" width of cranium	2.05-2.19	2.12
<i>Female</i>					
"	"	"	" palatal length	2.83-2.92	2.88
"	"	"	" length of upper cheek teeth	2.60-2.75	2.78
"	"	"	" length of rostrum	3.22-3.52	3.37
"	"	"	" zygomatic width	1.38-1.40	1.39
"	"	"	" mastoid width	1.98-1.99	1.99
"	"	"	" width outside molars	2.71-2.75	2.73
"	"	"	" width of cranium	1.94-2.01	1.97

ALOUATTA PALLIATA PIGRA subsp. nov.

Type. Adult male, skin and skull, no. 63510 Museum of Zoölogy, University of Michigan, from Uaxactun, Peten, Guatemala; collected May 4, 1931, by A. Murie.

Description. Externally this subspecies may be distinguished by the larger size and the absence in both sexes of any light markings on the flanks. The males, females and the single young one examined were all coal black. The bases of the hairs are either black or a very deep "seal brown," and owing to the fact that the fur is less dense and shorter on the limbs and tail this paler shade shows through the dark tips of the hair giving a slightly brownish tint to the general color in these areas. The hair is thick and fine and relatively rather long when compared with that of either typical *A. p. palliata* or *A. p. mexicana*.

Skull. The skull is large and massive with very pronounced ridges; the braincase is relatively narrow and flattened with a broad, flat, slightly depressed area centrally immediately posterior to the orbits, forming in old males a marked concavity. The orbital ridges are prominent with a pronounced antero-posterior thickening on the outer margin that is enlarged into an angular projection at the top of the zygoma. The interorbital space is broad and flat, the nasal aperture large with a much longer distance from the tip of the nasals to gnathion than in the rest of the species. This is accompanied by a proportional but not so marked lengthening of the rostrum. As compared with *A. p. palliata*, the average width across the zygomatic arches is slightly narrower in relation to the total length of the skull. Notably these arise less abruptly from the rostrum and slope more gradually to the lambdoid ridges over the auditory meatus. A comparison of the mastoid width and the width across the molars with the total length emphasizes the fact that the skulls of this form are proportionally longer and narrower than those of *A. p. palliata*. In this respect Costa Rican howlers are most similar to *A. p. pigra* with only a small average difference. The relative length of the palate and of the upper cheek teeth is about the same in both forms. The ventral surface of the skull presents numerous quite distinctive characters. The pterygoid is much broader antero-posteriorly, and the distance from the alveolus of the last molar to the concavity of the posterior border of the pterygoid is much greater. The delicate hamular process arises rather far anteriorly on the lateral lamina of the pterygoid. The mastoid projection is much more massive, and extends farther posteriorly.

The sexual difference in skull size in *A. p. pigra* is great. In general

the distinctive features found in the male skulls obtain for the female skulls also, but to a less marked degree. In these the most pronounced characters are the longer and narrower shape of the skull, the tapering of the zygomatic arches, the great length from the tip of the nasals to gnathion, the size and shape of the pterygoids, and the thickening of the orbits. The skulls are not as flat on top and there is no interorbital depression.

Remarks. This subspecies is based on a series of twelve specimens collected in 1931, in Uaxactun, Peten, Guatemala, by A. Murie. Five of the specimens are adult males, three skin and skull, two skull only; six of them are females, three skin and skull, three skull only, (one of them without the lower jaw); one of them is a young one, skin and skull. Coming from the same area it is highly probable that many of them were shot out of the same band, and for this reason some of the characters emphasized may not be found to quite so marked a degree in other individuals of the same form collected in less closely associated areas. The differences, however, are so definite that they unquestionably indicate a separate subspecies; indeed, if it were not for the form found at Mountain Cow which seems to be intermediate between this and typical *A. p. palliata*, one might be justified in calling it a distinct species. This is by no means the first record of a black howling monkey taken in Guatemala. *Myctes villosus* Gray, 1845, has been ascribed to this region, but the origin of the type is so obscure that it is impossible to decide to what form this name should apply. It was based on a single, poorly preserved, young specimen which Gray believed came from Brazil. No cranial characters were given, the principal distinctive features being the "abundance, softness and length of the hair; but unfortunately it is in such bad condition that we cannot be quite certain of the direction of the hair on the forehead, though it appears to be directed forward" (Gray, 1845). This specimen is one of a series of nine new species all described in this same paper and all but one supposed to inhabit "Brazils." Because of the wide range of color variation Gray had thought it advisable "that the various specimens which we have in the British Museum should be accurately described, leaving the consideration of the permanence of the distinctions pointed out to be determined at some future time, or by a person more fortunately placed for such a purpose" (Gray, 1845). The manner in which the hair is directed on the forehead and the length and softness or stiffness of the hairs are the two characters which he considers most important taxonomically, though he does mention some few color variations. Selater in 1872 writes that "Mr.

Salvin has often spoken to me of the Black Howler of Vera Cruz; but it is only recently that I have had an opportunity of examining a skin of this animal obtained by him in that district in May, 1862." I have been unable to locate "Vera Cruz" on any maps of Guatemala, and think that undoubtedly he meant "Vera Paz," especially as he himself later refers to the animal as "Guatemalan," and quotes from Salvin in describing the locality visited as follows: "It (the black howler) is abundant throughout the eastern portion of the republic, but is unknown in the forest clad slopes which stretch towards the Pacific Ocean. In the former region it is found at various altitudes over a wide expanse of country. I have heard its cry on the shores of Lake Yzabal, and all through the denser forests of the valley of the river Polochic. It is very common, from the steep mountain road which lies between the upland village of Perula and S. Miguel-Tucuru, and especially in the wilderness of uninhabited forest which stretches from Telemán to the Lake Yzabal. In the unbroken forest country which occupies the whole of the northern portion of Vera Paz, from Cobán and Cahabón to the confines of Petén, it is also abundant" (Selater, 1872). It becomes clear from the above that all of the country referred to by Salvin lies within the provinces of Vera Paz and Yzabal. Selater first believed this animal to be undescribed, but on comparing it with the type of *Myctes villosus* decided that they were the same, and that Gray's specimen did not come from Brazil. In regard to this he writes: "I think it is probable that there has been a mistake in the locality and that it is identical with the Guatemalan animal." He gives no further evidence to support the theory that an error really was made, and seems to base his conclusion entirely on a similarity between the two specimens. He describes his animal as having "long soft hairs, which below show a rufescent tinge," and "the hair on the face being inclined forwards instead of reversed." Too much importance cannot be given to color as the male of *Alouatta caraya* from Brazil is also black; and Schlegel, in 1876, after examining a larger series from Guatemala, some of them collected in Salvin's own localities, states that the direction of the hair on the forehead is not diagnostic as he has found individuals with both types of hair growth collected in the same place. Nevertheless he, also, accepts Guatemala as the type locality for *M. villosus*. Alston in 1879 recapitulates the work of Selater and of Schlegel, and agrees that Gray's form probably did come from Guatemala though he offers no further evidence. None of this is very conclusive, the type of *villosus* is a young, poorly-preserved specimen; as I have pointed out above, black howlers occur also in

Brazil, and the direction of the hair on the forehead is so variable as not to be diagnostic. Further, even if one should accept Sclater's conclusions as to the correct type locality, there is absolutely no way of determining the exact spot in Guatemala where *M. villosus* was taken and so of identifying it either with *A. p. pigra*, or with *A. p. luctuosa*. For this reason it has seemed advisable to reidentify the howler monkeys of this region and to regard *M. villosus* as indeterminable due to the absence of a type locality and the imperfect condition of the type.

Geographical distribution. Enough specimens of this form have not been taken to admit of any accurate statement on its range. The only ones that I have been able to examine all came from the same place in the northern part of Guatemala. Because of their peculiarly heavy-boned structure, associated, I believe, with the country in which they are found, I should expect this to be the race of the forests of the limestone region of northern Guatemala and Yucatan.

Specimens examined. Guatemala, Peten, Uxactun, five males, three skin and skull, two skull only; six females, three skin and skull, three skull only; one young, skin and skull.

				Skull ratios	
<i>Male</i>				Range	Average
Greatest length divided by palatal length				2.74-3.00	2.87
"	"	"	" length of upper cheek teeth	2.68-2.81	2.75
"	"	"	" length of rostrum	3.00-3.30	3.23
"	"	"	" zygomatic width	1.43-1.55	1.49
"	"	"	" mastoid width	2.03-2.23	2.08
"	"	"	" width outside molars	2.93-3.23	3.07
"	"	"	" width of cranium	2.18-2.44	2.34
<i>Female</i>					
"	"	"	" palatal length	2.79-3.00	2.86
"	"	"	" length of upper cheek teeth	2.72-2.77	2.74
"	"	"	" length of rostrum	3.20-3.42	3.31
"	"	"	" zygomatic width	1.48-1.57	1.53
"	"	"	" mastoid width	1.96-2.09	2.03
"	"	"	" width outside molars	2.72-3.00	2.84
"	"	"	" width of cranium	2.08-2.22	2.16

ALOUATTA PALLIATA LUCTUOSA subsp. nov.

Type. Adult male, skin and skull, no. 24059 Museum of Comparative Zoölogy, from Mountain Cow, Cayo District, British Honduras; collected 12 April 1928, by Oliver L. Austin, Jr.

Description. This is another black form distinguishable externally from *A. p. pigra* by its definitely smaller size. The fur is long, silky and very thick, as in *A. p. pigra*, particularly long immediately behind the shoulders. The ends of the hairs are black giving the animal its general color; the bases, however, are dark "seal brown." In the mid-dorsal line posteriorly, on the shoulders, and especially on the sides of the face these are quite pale, while immediately below the ears they become light "fawn" color.

Skull. The skull is moderately long and not very massive, and is intermediate between that of typical *A. p. palliata* and *A. p. pigra*. The braincase is rather broad and rounded; instead of being depressed back of the orbits it is quite dome-shaped. None of the ridges is unusually pronounced. The interorbital space is broad and flat, and the nasal aperture large with a relatively long distance from the tip of the nasals to gnathion. As in *A. p. pigra* this is accompanied by a proportional lengthening of the rostrum. The width across the zygomatic arches is slightly narrower proportionally to the total length than in *A. p. palliata*; these latter arise less abruptly from the rostrum and slope back very gradually to join the lambdoid ridges over the auditory meatus. The ratio of mastoid width and of width across the braincase to the total length is most nearly like that in *A. p. palliata*. The most distinctive cranial characteristics, however, are to be found on the ventral surface. The pterygoids seem to be very different from those found in any of the other forms: very broad antero-posteriorly with smoothly rounded edges. Their posterior margin descends rather abruptly but without any sharp reëntrant angle, the anterior margin is very long, and slopes gradually. As in *A. p. pigra*, the distance from the alveolus of the last molar to the concavity of the posterior border of the lateral lamina is great, and the hamular process arises rather far anteriorly. The audital bullae are larger and more inflated than in either of the above; when compared with *A. p. pigra* this difference is especially pronounced. In some few cases the bullae of typical *A. p. palliata* are almost as inflated but in no instance are they quite as large and they never extend posteriorly so near to the occipital condyles. The mastoid processes are large and extend much farther posteriorly than in *A. p. palliata*.

Remarks. I have been able to obtain only one specimen from this area, and have hesitated considerably before describing a new subspecies from a single individual, especially in a genus where individual variation is known to be so great. Uaxactun and Mountain Cow are not nearly as widely separated as are some of the northern and southern localities where typical *A. p. palliata* is found. There are no very marked natural barriers between them and the type of country is not very markedly different. The specimen is interesting because it seems to link the otherwise very aberrant form from northern Guatemala with the more typical Central American *A. p. palliata*; and it is only because the skull characters are so definitely intermediate between the two groups that I felt it necessary to describe this as a new form. The black, dense pelage, the shape of the zygomatic arches, the interorbital breadth, the large nasal aperture, the breadth of the pterygoids, and the size of the mastoids all relate it to *A. p. pigra*. On the other hand certain of the features that are most important in separating some of the other subspecies of this genus, particularly the size of the skull and the relative proportion of width of braincase to total length relate it to *A. p. palliata*. The more inflated audital bullae and the smoother margin of the pterygoids also link it with this latter form. The existence of so distinct a form as *A. p. pigra* in a small part of a general region where all the rest of the howler monkeys are so closely allied was very puzzling at first, and so I was particularly interested to be able to link them up so definitely through *A. p. luctuosa* with *A. p. palliata*. The very marked difference of the northern form may be accounted for, I believe, in two ways. A study of the rocks of Central America reveals that in northern Guatemala and the peninsula of Yucatan the rocks are predominantly limestone while in the rest of the area they are very largely volcanic. The large skulls and generally heavier-boned structure of *A. p. pigra* therefore are probably due to a much greater per cent of lime in their food and water. Perpetuation of these and other distinctive cranial characters is probably helped by the tendency of these monkeys not to range very far and to interbreed rather closely within each troop.

Geographical distribution. More specimens are needed before the distribution of this form can be determined. It is probably limited to a fairly small area in British Honduras, and merges gradually with *A. p. pigra* to the west and *A. p. palliata* to the south.

Specimens examined. One, the type, from Cayo District, Mountain Cow, British Honduras.

Skull ratios

Greatest length divided by palatal length	2.83
“ “ “ “ length of upper cheek teeth	2.60
“ “ “ “ length of rostrum	3.09
“ “ “ “ zygomatic width	1.41
“ “ “ “ mastoid width	1.94
“ “ “ “ width outside molars	2.98
“ “ “ “ width of cranium	2.14

ALOUATTA PALLIATA MEXICANA Merriam

Alouatta palliata mexicana Merriam, Proc. Biol. Soc. Washington, **15**, 1902, p. 67; Allen, Bull. Am. Mus. Nat. Hist., **20**, 1904, p. 40; Elliot, Publ. Field Columb. Mus., Zoöl. Ser., **4**, Pt. 2, 1904, p. 727; Id. Publ. Field Columb. Mus., Zoöl. Ser., **6**, 1905, p. 533; Id. Publ. Field Columb. Mus., Zoöl. Ser., **8**, 1906, p. 555; Elliot, Mon. Ser. Am. Mus. Nat. Hist., **1**, 1912 (1913), p. 272.

Type specimen. Adult male, skin and skull, no. 79398 U. S. Nat. Mus., Biological Survey Coll., from Minatitlan, Vera Cruz, Mexico; collected April 23, 1906, by E. W. Nelson and E. A. Goldman.

Description. The similarity in size between these monkeys and *A. p. palliata* as well as the wide range of color variation found in both forms makes a subdivision based on external characters alone almost impossible. There are, however, some few differences in markings which together with certain skull traits make this form quite distinct. Principal among these are the more diffuse distribution of light-banded hairs over the back, and the paler more silvery bases of the hairs on the flank and on parts of the dorsal region. The head, shoulders, limbs, tail, and occasionally a mid-dorsal line are black; sometimes this is replaced on the upper parts of the limbs and tail, and on the shoulders by a very dark "seal brown." In the darker forms the bases of the dark body hairs are "walnut"; in the forms where grizzling extends widely over the back all conditions are found from individuals where the hair is predominantly silver at the base to those with these silver-based hairs very sparsely scattered throughout the "walnut" ones. The grizzled effect is produced by one or two rings of silver or pale "tawny" near the tip of the hair; these vary in width and in exact position. The pale flank hairs extend from the armpits to the groin and mingle rather gradually with the dark fur on the back. A comparison of their distribution with that in *A. p. palliata* shows that in the former they are more evenly scattered over the whole back as far anteriorly as the shoulders and occasionally the neck. There is no

tendency to concentrate posteriorly. In those individuals where the light coloring is restricted, the black hairs form a stripe of varying width along the whole length of the back. In color the flank hairs are generally distinguishable from those of *A. p. palliata* by their much more silvery bases, toward the tips they become golden "tawny," and sometimes at the extreme end, dark "seal brown."

Skull. The skulls of both sexes may be identified principally by their longer, narrower braincases; this gives the skulls the appearance of being smaller than those of *A. p. palliata* though the actual difference is not as great as Merriam's description seems to indicate. There is a proportional narrowing of the rostrum, and a slight but not as marked narrowing of the mastoid width in relation to the total length. The zygomatic arches bow out slightly more than do those in *A. p. palliata* so that the ratios of zygomatic width to total length are more nearly alike in the two forms than are the other width to length ratios. Although the upper tooth row does not seem to be markedly shorter in proportion to total length, the last two molars themselves are on the whole slightly shorter than are those of *A. p. palliata*. There is a slight tendency for the braincase to round upward immediately back of the orbits, and the coronoid process of the lower jaw is somewhat more broadly rounded.

Remarks. Merriam in describing this form states that it is "similar to *A. p. palliata* but much smaller." A comparison of the measurements of this subspecies given by him, and by J. A. Allen (1904) with similar measurements of *A. p. palliata* shows that the range of variation of the former falls well within that of the typical form. This uniformity of external measurements is further borne out by a marked similarity in skull length. The original description of *A. p. mexicana* points to the "narrower and more tapering" rostrum, "the coronoid process more broadly rounded," and the "teeth (especially the last molar) decidedly smaller," which together with the longer, narrower braincase are, obviously, the most important cranial characters of this subspecies. Mention is also made of the zygomata being "less expanded vertically and lacking the hump on upper side posteriorly." A study of a long series of skulls of *A. p. palliata* leads me to believe that in all of its forms both of these traits are products of individual variation and that the former, particularly, is very dependent on the age of the animal. Allen in 1904 points to the fact that the original description of *A. p. mexicana* contains no mention of external characteristics and, comparing them with a series of specimens from Chiriqui, he quite rightly states that they are much duller colored, "the flanks

in the brightest specimens as obscurely colored as in the very palest of the Chiriqui examples, none of them presenting the golden rufous so characteristic of the latter." This proves to be somewhat misleading, however, when we compare *A. p. mexicana* with examples of typical *A. p. palliata* collected in Matagalpa, Nicaragua, and in Talamanca, Costa Rica; here the color is considerably darker than in the Mexican howler, and, as I have shown above, there is also a tendency for the flank hairs to be golden rather than silver.

Certain members of this group are further marked in an odd and rather abnormal manner with yellowish-white bands around the tail and similarly colored markings on the feet. Three of the females, one of the males and a young one were all marked in this way. The extent of these markings varies in the different specimens: on the dorsal surface of the tail the band was never much over an inch and a half wide while on the ventral surface it sometimes extended far along the naked palm. When the feet had white markings, their palms were always spotted with white, while the toes were sometimes completely white, even the nails, but in other cases they were merely ringed with white around the bases. Although this probably has no differential significance, it is interesting that a marked tendency toward this peculiarity seems to be limited to this group and to the howler monkeys on Coiba Island.

Geographical distribution. These monkeys are found principally in the southeastern part of Mexico in the province of Vera Cruz; they probably extend as far south as the edge of the limestone region where *A. p. pigra* is found, and north as far as howler monkeys occur.

Specimens examined. Six from Pasa Nueva, State of Vera Cruz, Mexico, three male and three female, all skin and skull; four from Achotal, Vera Cruz, one male and three female, all skin and skull.

Skull ratios

<i>Male</i>		<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length		2.59-2.81	2.70
" " " " length of upper cheek			
	teeth	2.62-2.74	2.68
" " " " length of rostrum		3.15-3.31	3.22
" " " " zygomatic width		1.34-1.39	1.37
" " " " mastoid width		2.04-2.14	2.07
" " " " width outside molars		2.91-3.08	3.00
" " " " width of cranium		2.27-2.37	2.31

<i>Female</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.68-2.86	2.78
"	"	"	" length of upper cheek		
			teeth	2.64-2.76	2.70
"	"	"	" length of rostrum	3.39-3.50	3.46
"	"	"	" zygomatic width	1.42-1.48	1.46
"	"	"	" mastoid width	2.06-2.17	2.12
"	"	"	" width outside molars	2.81-3.03	2.95
"	"	"	" width of cranium	2.15-2.24	2.18

SUMMARY

Seven subspecies of *Alouatta palliata* have been recognized here, *A. p. palliata*, from Costa Rica, Nicaragua, and Honduras, *A. p. acquatorialis* from Panama and the Pacific coast of South America as far south as Ecuador, *A. p. trabeata* subsp. nov. from the Azuero Peninsula in Panama, *A. p. coibensis* from Coiba Island of the Pacific coast of Panama, *A. p. pigra* subsp. nov. from northern Guatemala, *A. p. luctuosa* subsp. nov. from British Honduras, *A. p. mexicana* from Vera Cruz Province in Mexico. Subspecific variation amongst these monkeys is notably very small and individual variation is relatively great. For this reason groups are separated on the basis of average differences and in most cases extreme individuals may be found in each group that resemble very closely individuals of some other subspecies. This is especially true of *A. p. palliata* and *A. p. acquatorialis*, and in Panama transitional forms are found that are very intermediate between the two. *A. villosus* (Gray) has been discarded owing to the imperfect condition of the type, and the impossibility of determining the type locality. *A. p. inconsonans* (Goldman) proves to be synonymous with *A. p. acquatorialis*.

EXTERNAL MEASUREMENTS

Alouatta palliata palliata

No.	Locality	Total length	Tail	Hind foot	Ear	Sex	Collector
A.M. 24437	Costa Rica, Talamanca	1105	625	150	..	Male	M. A. Carriker, Jr.
" 24436	" "	1125	610	150	..	"	"
" 24438	" "	1105	625	150	..	Female	"
A.M. 29849	Nicaragua, Matagalpa	1170	600	170	..	Male	W. B. Richardson
" 28425	" "	1080	560	120	..	"	"
" 28426	" "	1120	620	130	..	"	"
" 28973	" "	1200	640	140	..	"	"
" 28947	" "	1290	660	140	..	"	"
" 29848	" "	1150	570	140	..	"	"
F.M. 22394	Honduras, San Pedro	1050	580	...	..	"	K. P. Schmidt, L. L. Walters
" 22395	" "	1035	580	...	..	Female	"

Alouatta palliata acquaretorialis

F.M. 14223	Panama, Boquete	1255	650	150	30	Male	J. H. Batty
" 14229	" Boqueron	1110	600	135	25	"	"
A.M.	" Boquete or Boqueron	1180	630	150	30	"	"
"	" "	1020	500	140	25	"	"
"	" "	1095	570	135	30	"	"
"	" "	1160	590	140	35	"	"
"	" "	1195	630	155	35	"	"
"	" Boquete	1090	560	135	25	Female	"
"	" "	1075	560	140	35	"	"
F.M. 14227	" "	1130	600	135	30	"	"
" 14225	" "	1130	600	135	30	"	"
" 14226	" "	1100	610	125	30	"	"

Alouatta palliata acquatortialis

No.	Locality	Total length	Tail	Hind foot	Ear	Sex	Collector
U.S.N.M. 257308	Panama Canal Zone	1117	608	132	31	Female	R. K. Enders
Am. Mus. 66709	Ecuador, Cerro Manglar Alto	1195	630	154	..	Male	G. H. H. Tate
" 66713	" "	1080	570	140	..	"	"
" 66712	" "	1165	635	150	..	"	"
" 66711	" "	1135	618	138	..	Female	"
" 66710	" "	1092	590	150	..	"	"
" 66707	" "	1087	593	139	..	"	"
" 66708	" "	1166	608	145	..	"	"
" 62831	Ecuador, Cerro Bajo Verde	1160	603	146	..	Male	"
" 62834	" " "	1120	590	148	..	Female	"
" 62827	" Vines	1135	645	136	..	Male	"
" 62824	" "	1125	604	133	..	"	"
" 62830	" "	1205	590	149	..	"	"
" 62832	" "	1105	567	142	..	"	"
" 62825	" "	1092	586	136	..	Female	"
" 62828	" "	1165	667	142	..	"	"
" 62833	" "	1020	661	148	..	"	"
" 46505	El Chiral	1080	590	138	..	"	"
" 66705	Cuaque	1180	619	147	..	"	H. E. Anthony

EXTERNAL MEASUREMENTS

Alouatta palliata pigra

No.	Locality	Total length	Tail	Hind foot	Ear	Sex	Collector
U.M. 63505	Guatemala, Peten, Uaxactun	1260	665	160	40	Male	A. Murie
" 63503	" "	1350	707	165	45	"	"
" 63510	" "	1280	680	156	37	"	"
" 63504	" "	1180	640	142	36	Female	"
" 63506	" "	1170	670	145	35	"	"
" 63511	" "	1170	663	145	37	"	"

Alouatta palliata luctuosa

M.C.Z. 24059	Brit. Honduras, Mountain Cow	1200	600	130	25	Male	O. L. Austin, Jr.
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Alouatta palliata mexicana

A.M.	Mexico, Vera Cruz	1142	585	145	..	Male	E. A. Colburn
"	" "	1140	620	153	..	"	"
"	" "	1212	635	152	..	"	"
"	" "	1115	604	153	..	"	"
"	" "	1189	661	150	..	Female	"
"	" "	1123	630	148	..	"	"
"	" "	1119	605	148	..	"	"
"	" "	1110	620	146	..	"	"
"	" "	1107	618	152	..	"	"
"	" "	1100	625	148	..	"	"

CRANIAL MEASUREMENTS

Alouatta palliata palliata

No.	Male													Locality	Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar		
24437 Am. Mus.	119	99.5	93.5	40.5	37.5	82	58	53	39.5	42	48	4.7	6.5	Costa Rica, Talamanca, Cuabre	Lower canines missing. R. zyg. and R. mastoid missing.
24436 "	114.5	96.5	89	41.5	35	82	56.5	51.5 (broken)	37	41	46.5	5.0	6.7	Costa Rica, Talamanca, Cuabre	
5323 M.C.Z.	112	95	90	38.5	33.5	79	55	51	38	41.5	46.5	5.2	6.7	Costa Rica, Talamanca	
5333 "	111	96	90	40	33.5	....	....	....	38.5	41	47	5.0	6.7	"	
14141 U.S.N.M.	115.5	98	90.5	38.5	35	83.5	56.5	53	41	43.5	49.5	5.1	7.0	"	Occiput missing; skull deformed; left zyg. abn.
102086 "	....	....	....	40	32.5	74	56.5	51	35	42.5	48	5.2	6.8	" La Carpintera	
Female															
5331 M.C.Z.	107	89	83	39	31.5	73.5	51.5	49	36	39	44.5	4.6	6.7	Costa Rica, Talamanca	3 molars missing. Left zyg. missing. Right zyg. missing. Back of skull -; 3 molars missing. Both zyg. broken; canine. Alveoli of front incisors broken; zyg. asymmetrical abnorm. flattened.
5325 "	98.5	85	79	32.5	29	69	48.5	46	35	38.5	42.5	4.7	6.6	"	
5324 "	....	89	83	34	31.5	73	54.5	52	37.5	40	44	4.7	6.5	"	
5328 "	106	88.5	83	37	31	....	51.5	50	38	39	44	4.6	6.3	"	
5329 "	109.5	90.5	84.5	38	32	....	54	49.5	36.5	39	44	4.2	6.0	"	
5326 "	....	....	....	37	....	74.5	....	....	....	....	....	....	....	"	
5327 "	102.5	85.5	81.5	35.5	29	70	53	52	36.5	38	43.5	4.8	6.5	"	
14133 U.S.N.M.	104	87.5	81.5	37	28.5	68.5	51	49	35.5	37	42.5	4.7	6.3	"	
24434 Am. Mus.	106	88	81.5	37	30.5	75	55	49.5	35.5	39	44	4.8	6.2	"	
24438 "	105	88	84.5	37.5	31.5	74	51	49	36	39	43.5	4.6	6.2	" Carrita	
18917 F.M.	102	87	82	37	29.5	73	51.5	48.5	37	39	45	4.6	6.5	Costa Rica, Guayabo	

3 molars missing.
 Left zyg. missing.
 Right zyg. missing.
 Back of skull -; 3 molars missing.
 Both zyg. broken; canine-
 Alveoli of front incisors
 broken; zyg. asymmetri-
 cal abnorm. flattened.

Lower canines missing.
 R. zyg. and R. mastoid
 missing.
 Occiput missing; skull de-
 formed; left zyg. abn.

Alouatta palliata palliata

No.	Male													Locality	Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Maxilla width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar		
28425 Am. Mus.	103.5	86.5	80	34	27.5	72	56.5	54	38	38.5	46	5.6	6.9	Nicaragua, Savala	Young; upper canine, molar 3, lower c. not fully erupted.
29849 "	117	103	92.5	45	36.5	86.5	59	55	42	42	43	5.0	6.7	" Peña Blanca	
28973 "	....	100	93	42.5	35.5	83.5	56	53.5	38	41.5	49	5.0	6.6	" Matagalpa	Occiput broken; upper and lower c. broken.
29848 "	112	97	91.5	41	33	85	58	53.5	41	R.43	48	5.5	6.7	" "	
28426 "	107	92	85	37	31	73	56	53	40	41	43	5.6	6.8	" Savala	Type of A.p. matagalpae Allen; 3 & 3 M., Foremen Mag.
29847 "	114.5	....	93.4	40.5	35	....	....	53	40	44	50	5.1	6.9	" Uluce	Occiput broken; L. zyg. & L. mast. broken.
36906 U.S.N.M.	109	94.5	90	39	33	80.5	56.5	51	39	41	48	....	....	E. Honduras	R. zyg. broken, 3 & 3 molars—upper molars missing.
22394 F.M.	114	97	92	42.5	36	82	54	51	38	43	R.47.5	....	....	Honduras, S. Pedro, near L. Tichamaya	
Female															
22833 U.S.N.M.	98	83.5	76.5	33	27.5	65	48	48	34	37	43	4.5	5.9	E. Honduras	
22834 "	99.5	86	80	36.5	28	71	51	48	36.5	38.5	R.44	4.9	6.3	" "	
22395 F.M.	102	86	81	37	29.5	68.5	49	48.5	35	38.5	42	4.7	5.6	San Pedro, Honduras	

Alouatta palliata acquatorialis

No.	Male													Locality	Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Masloid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar		
38105 Am. Mus.	111	99	...	41	34	83.5	59	55	40	43	48	5.1	6.8	Panama, Tapalisa	Occiput broken; palate asymmetrical.
38104 "	...	...	...	37	33	80	55	51	40	41.5	47	4.9	6.3	"	Occiput missing.
38081 "	112.5	98.5	93	39	35	84	57.5	52	40	40.5	46	4.9	6.2	"	"
36712 "	111.5	97	91	39	34	83.5	55	53	41	41.5	48	4.7	6.4	Tacarcuna	"
240410 U.S.N.M.	114	99	93	41	35	81.5	57	51	39	42	46	4.7	6.3	Maxim Ranch	"
240471 "	...	104	98	45.5	...	86.5	59.5	...	40	42.5	48	4.6	6.4	Chucunaque	"
240406 "	109	92.5	86	37	33	...	56.5	54	37	40	46	5.2	6.4	"	"
257094 "	...	97	91	40.5	...	...	...	...	38	38.5	45	4.7	6.3	"	Upper incisor missing.
240407 "	107	94.5	89.5	39	32.5	78	55	50	38.5	41.5	47	4.9	6.8	"	Occiput missing.
240408 "	...	97	91	...	33	79.5	57.5	54	41	43	48.5	5.4	6.9	"	Left zyg. missing.
														"	Rt. zyg.-; rt. mastoid -.
														"	Back of occiput-; palate broken.
171069 Biol. Survey	117	102	95.5	40.5	35.5	83.5	59.5	55.5	40	44	49	5.2	6.3	"	"
21507 M.C.Z.	113.5	97.5	93	40	36	84	55	50	39	44	48	4.8	6.6	"	Cerro Azul
19790 "	...	...	92.5	39	36	85	58	56	39.5	45	50	4.8	6.7	"	Canal Zone
														"	"
29124 "	114.5	100	93.5	40.5	35	83.5	60	52	38.5	41.5	49	4.7	6.3	"	"
10139 "	123.5	...	101	44	...	...	58.5	52	41.5	45.5	52	4.9	7.2	"	Boquete
														"	M 3 missing.
														"	Ant. alveolar margin absorbed; condyles broken;
														"	l. zyg. missing.
														"	Alveoli of incisors absorbed; m 2 broken.
14223 Field Mus.	112	98	94	40.5	...	85	59	52	40.5	43.5	49	4.9	7.1	"	"
18934 Am. Mus.	115	100	95.5	40.5	34	86	57.5	53	39	42.5	48.5	4.9	6.5	"	"
153565 U.S.N.M.	119.5	102.5	99	43	38	85	58.5	52	39.5	44	...	5.0	7.0	"	Bocas del Toro
														"	Lower jaw missing; rt. zyg. broken.

Alouatta palliata aequatorialis

No.	Female													Locality	Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar		
3876 U.S.N.M.	103	88	82	35.5	31.5	65.5	51	49.5	...	...	...	...	...	Panama, Atrato R.	M 3 missing.
38185 Am. Mus.	96.5	83.5	79	34	27	69	52	51	35.5	37	41.5	4.4	5.8	Panama, Cituro	
271063 Biol. Survey	100	86	81	34	28	71.5	50	50	33.5	37.5	41.5	4.5	6.3	Cerro Azal	
171067 "	98	82.5	76.5	34	27	70	48.5	51	35	37.5	42.5	4.8	6.0	"	Molar 3 not erupted. Palate and rostrum broken Upper molars very worn
171064 "	106	90	85	...	...	73.5	54.5	52.5	38	40.5	44.5	4.9	6.5	"	
171071 "	108	90.5	84	37.5	30.5	74.5	54.5	51.5	37.5	37	41.5	4.4	5.9	"	
171070 "	104	90	84	37	30	74	52	48.5	39.5	40	44.5	4.7	6.4	"	Brain case asymmetrical. M 3 missing
171065 "	104.5	90	84	37.5	31.5	73	52	50.5	37	40	44	4.6	6.3	"	
171066 "	104	90.5	84	38	30.5	72	50	50	37	41	46	5.0	6.4	"	
257309 U.S.N.M.	102.5	88	82	34.5	29.5	70	51	48.5	35.5	40	43.5	4.9	6.4	Canal Zone	Brain case asymmetrical. M 3 missing
29050 M.C.Z.	102	87.5	81.5	35	30	69.5	49.5	51	34.5	37.5	41.5	R.4.2	R.6.3	"	
29051 "	107.5	92	86	36	31	71.5	53.5	51.5	37.5	36.5	41.5	...	...	"	
14225 Field Mus.	104	87.5	86	37	29	74	52	51.5	36.5	40.5	45.5	5.0	6.8	Panama, Boquete	Brain case asymmetrical. M 3 missing
14226 "	104	89.5	83.5	36	29.5	73	52	49.5	36.5	40	45.5	4.7	6.5	"	
14227 "	101	88.5	82	36	29.5	78	53.5	53.5	37	40	46	5.0	6.2	"	
10137 M.C.Z.	101	86.5	80.5	35	29.5	74	50	51	37	40	44	4.8	6.5	"	
18933 Am. Mus.	103	87.5	81	36.5	29	73	51.5	50.5	39	40	46	4.9	6.7	"	
14229 Field Mus.	100.5	87.5	81	34	29	71.5	50	50.5	35	38	43.5	4.8	6.4	Boqueron	

M³ missing.Molar³ not erupted.

Palate and rostrum broken

Upper molars very worn

Brain case asymmetrical.

M³ missing

Panama, Atrato R.

Panama, Cituro

Cerro Azul

"

"

"

"

"

"

Canal Zone

"

"

"

Panama, Boquete

"

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"

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"

"

Boqueron

Alouatta palliata aquatorialis

No.	Male												Locality	Remarks
	Greater length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar		
62831 Am. Mus.	113.0	98.5	91.0	38.5	32.5	75.5	57.0	54.0	38.0	43.0	48.5	5.5	6.6	Ecuador, Cerro Bajo Verde
66713 "	108.5	96.0	90.5	37.0	30.5	81.0	55.0	52.0	38.0	41.0	48.5	5.3	6.4	" Cerro Manglar
66712 "	114.0	104.0	98.0	41.0	34.0	85.5	58.0	53.5	38.0	42.5	48.0	4.9	6.7	Alto Ecuador, Cerro Manglar
66709 "	115.0	101.0	95.0	40.5	33.0	85.0	56.0	51.0	37.5	41.5	50.0	4.6	6.8	Alto Ecuador, Cerro Manglar
62824 "	113.5	99.5	94.0	42.0	35.0	81.5	56.5	50.5	38.0	43.0	50.0	5.6	6.9	Ecuador, Vinces
62830 "	120.0	102.0	97.0	39.0	35.0	86.5	60.0	53.0	38.5	42.0	47.5	5.4	6.6	" "
62827 "	107.0	95.5	87.0	39.0	31.5	75.5	54.0	48.5	38.0	43.0	48.5	5.5	6.7	" "
66706 "	114.5	102.5	96.0	41.5	34.5	84.5	57.5	53.0	39.0	43.0	49.5	5.1	6.8	" Ceracue
Female														
62834 "	104.0	89.0	82.5	35.0	30.5	71.0	54.0	53.0	36.0	38.5	45.0	...	...	" Cerro Bajo Verde
46505 "	97.0	81.5	76.5	31.5	26.0	67.0	52.0	50.5	33.0	36.5	41.0	4.6	5.9	" El Chiral, Prov. del Aro
66710 "	104.5	90.0	83.5	35.0	29.5	74.5	54.5	52.5	39.0	40.0	46.0	5.3	6.5	Ecuador, Cerro Manglar
66707 "	105.5	92.0	86.0	37.0	30.0	70.0	50.5	49.0	36.0	39.0	44.5	4.9	6.2	Alto Ecuador, Cerro Manglar
66711 "	101.5	88.5	82.0	35.0	28.0	72.0	53.0	51.0	36.5	37.5	43.0	4.8	6.3	Alto Ecuador, Cerro Manglar
66708 "	107.0	91.0	85.0	36.0	29.5	73.0	54.5	50.0	36.5	39.0	45.0	4.9	6.5	Alto Ecuador, Cerro Manglar
62825 "	98.0	84.0	78.0	34.0	28.0	69.0	51.0	49.5	36.0	39.0	44.5	5.2	6.3	Ecuador, Vinces
62828 "	102.0	87.0	82.0	35.0	28.0	75.5	53.5	50.0	37.0	39.0	43.0	5.2	6.3	" "
80499 "	102.0	90.0	84.0	36.0	29.0	69.5	52.0	50.5	35.5	40.0	45.0	4.9	6.6	" "
66705 "	103.0	88.0	83.0	37.0	30.0	73.5	54.0	52.5	38.5	41.5	47.0	5.4	6.8	" Ceracue
27325 M.C.Z.	100.0	88.0	84.0	36.0	28.0	70.0	52.0	50.0	37.0	39.5	45.0	4.7	6.4	" Mindo
27326 "	100.5	86.0	80.5	34.0	27.0	72.5	53.0	49.0	37.0	39.5	45.0	4.7	6.4	" "

Palate slightly broken.

Alouatta palliata trabecata

No.	Male													Locality		Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar	Type		
28736 M.C.Z.	111	98	93	40	34.5	82	54	51	37	42	46.5	4.7	6.5	Panama, Herrera, Parita	Upper incisors -. Canines not fully erupted. Teeth very worn.	
29545 "	111	96	90.5	40.5	35	82	55	52	38	43	48	4.8	7.3	" Capina		
29546 "	112	98	91	40	35	84	57	52.5	38	43	47	4.9	7.5	Panama, Herrera, Capina		
Female																
U.S.N.M.	97.5	84.5	79	35.5	29.5	69	49.5	48.5	34.5	39.5	43	4.8	6.3	Panama, Herrera, Parita	Upper incisors -. Canines not fully erupted.	
28735 M.C.Z.	100	87	81	35	29.5	68.5	49	49	34.5	40	44.5	4.7	6.7	" "		
U.S.N.M.	99	86	81.5	36	30	71.5	51	49.5	35	39	43	4.7	6.2	" "		
"	99.5	86	80.5	35	29.5	69	48	47.5	35	39	43	...	...	" "		
29548 M.C.Z.	99	86.5	81	36	30	71	50.5	49	36.5	41	46	5.0	6.8	" Capina	Teeth very worn.	
29547 "	98	85.5	80	36	29.5	67.5	48	50	34	38	42.5	4.6	6.5	Panama "		
29544 "	95	81.5	77	35	27.5	68.5	51.5	49.5	35.5	38	43	4.5	6.3	Panama, "		
27784 "	97.5	84.5	80	35	30	68	47	48.5	35.5	39.5	43	4.6	6.9	Panama, Herrera		

Upper incisors -.
Canines not fully erupted.
Teeth very worn.

Alouatta palliata coibensis

No.	Male													Locality		Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar			
26887 Am. Mus.	104.5	90	85	37	32	77	51	49	35	40	45.5	4.7	6.5	Panama, Coiba Island	Alv. m. partly absorbed.	
29611 M.C.Z.	103.5	90.5	85	37	30.5	81	54	50.5	36.5	41.5	46	4.8	6.2	"		
29610 "	105	93	89	38	33	77	50	48	38	40.5	45	4.6	6.3	"		
Female																
26886 Am. Mus.	95	81	75	32.5	27	68	48	49	35	34.5	42.5	...	...	Panama, Coiba Island	Incisors -; ³ & ³ molars missing.	
26885 "	96.5	82.5	76.5	34	30	70	48.5	48	35	37	41	4.5	5.7	"		

Incisors -; 3 & 3 molars missing.

Alouatta palliata mexicana

No.	Male													Locality		Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar			
13895 F.M.	112.5	95.5	91	40	34	81	52.5	48	36.5	42	48	4.6	6.7	Mex., V.C., Achotal	3rd lower molar missing; 1st premolar very worn	
17229 Am. Mus.	112.5	100	94.5	43.5	36	83	54.5	49.5	38.5	41	44	4.8	7.2	" " Pasa Nueva		
17239 "	112	96.5	92	42.5	35	83.5	55	48.5	36.5	42	47	5.1	6.7	" " "		
17232 "	109	93	87.5	39.5	34	78.5	53.5	48	37.5	41.5	46	5.1	6.7	" " "		
Female																
17230 Am. Mus.	103	86	80	36	29.5	72.5	50	47.5	35	39	44	R. 4.5	5.7	Mex., V.C., Pasa Nueva		
17235 "	100	83.5	78	36	29.5	69	47	46.5	33	37	41.5	4.3	5.9	" " "		
17231 "	103	86	80.5	36	30	69.5	48.5	47.5	34	38.5	44	...	"	" " "		
13892 F.M.	102	85.5	80.5	38	30	69	47	45.5	35	37	42.5	4.6	5.6	" " Achotal		
13894 "	98.5	82	77	36	28.5	69.5	46.5	45.5	35	37.5	43	4.5	5.9	" " "		
13901 "	105	86	80.5	38.5	30	72	50	47.5	35.5	38	43	4.8	6.0	" " "		

Alouatta palliata pigra

No.	No.	Male														Locality		Remarks
		Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of brain case	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar				
63503	Unit. of Mich.	131.5	122	116	43	43.5	91	64	58	44	46.5	52	5.5	7.5	Guatemala, Peten, Uuxactun	Molar 3 and upper & lower canine missing.		
63511	" "	122.5	112.5	107	41	39	79	60	51.5	39.5	44	50	5.3	6.1	" "			
63510	" "	126	119	113.5	46	12	88	61.5	58	43	45	50	5.5	6.7	" "			
63512	" "	126	115.5	110	42	39	82.5	56.5	52	39	46.5	50.5	5.1	6.6	" "			
63505	" "	122	112	106	42	37	82.5	59	50	38.5	45.5	50.5	5.7	7.0	" "			

Female

63507	"	104.5	93	87.5	37.5	31	68.5	51.5	50	38	38.5	46	5.7	6.4	"
63514	"	105.5	94	89	37	33	69	51	47.5	36	40	45	5.0	5.9	"
63504	"	106.5	96	90	35.5	33	67.5	51	48	35.5	38.5	43	4.7	5.9	"
63506	"	106	92	86.5	38	31	71.5	54	51	39	40	45	5.5	6.0	"
63508	"	108	96	88	37.5	32.5	71	53.5	49	38.5	41	46	5.5	6.1	"
63513	"	.....	.....	...	34	31	64	49	48	37	40	....	5.2	5.8	"

Palatal suture not closed.

No lower jaw. Molars missing.

Alouatta palliata lucuosa

	Male														
24059 M.C.Z.	114.5	109	101.5	40.5	37	81.5	59	54	38.5	44	49	5.7	6.4	Brit. Honduras, Cayo Dist. Mountain Cow	

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THREE NEW CUBAN MILLIPEDS, WITH NOTES ON
TWO LITTLE-KNOWN SPECIES

By H. F. LOOMIS

U. S. Department of Agriculture,
Bureau of Plant Industry

WITH ONE PLATE

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No. 9.— *Three New Cuban Millipeds, with Notes on Two Little-Known Species*

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U. S. Department of Agriculture,
Bureau of Plant Industry.

Through the courtesy of the Museum of Comparative Zoölogy, Cambridge, Massachusetts, I received recently a small collection of Cuban millipeds for identification. The specimens were collected by Mr. L. D. Christenson, mostly from soil of fields of sugar-cane, and represent seven species; two of which are described as the types of new genera; another is a new species of the West Indian genus *Cubocrius*, and is the largest milliped thus far known from the Western Hemisphere; three other species are reported for the first time since they were described; and the seventh is a species common throughout tropical America.

The types and other specimens of these millipeds are deposited in the Museum of Comparative Zoölogy, under an agreement with the Sugar Club of Cuba whereby Harvard University assumes responsibility for the care of the collections and equipment formerly at the Sugar Club Laboratory at Baragua, Cuba. This material becomes the property of the University after five years, unless the Sugar Club reestablishes another research station.

Family POLYXENIDAE

POLYXENUS LONGISETIS Poc.

Polyxenus longisetis Poc., Jour. Linn. Soc., **24**, 1894, p. 474.

One mature specimen and four with eight segments, believed to be this species, were collected from soil in sugar-cane fields at Jatibonico, at different times in 1931.

Pocock's description of this species, which he recorded from Mus-tique and St. Vincent, is very brief, not even the exact size of the body being given, but from his drawing of the animal it probably was slightly over 3 mm. long, the terminal pencil of hairs excluded. In January, 1932, the writer collected a *Polyxenus* on Mt. Misery, St. Kitts, which coincides with the description of *longisetis*, as far as that goes. Comparison of these specimens with those from Cuba leaves little doubt of their being the same species, although none of them

measured 3 mm. in length, the largest Cuban one being 2.5 mm. long, with the pencil of hairs adding a quarter millimeter. The antennae are long and slender, with the last two joints subequal in length and together as long as joint 6. The pencil of hairs at the back of the body is 6 or 8 times as long as broad and composed of very slender barbed hairs having a number of recurved hooks along one side approaching the apex. (Fig. 1-3.)

Family EPINANNOLENIDAE

EPINANNOLENE CUBENSIS (Bollm.)

Nannolene cubensis Bollm., Proc. U. S. Nat. Mus., 11, 1888, p. 335.

A single female of this species, which has not been reported since its original discovery, was collected from soil in a cane field at Central Agramonte, Aug. 7, 1931.

Length about 20 mm.; width 1.5 mm.; number of segments 46.

First segment with the sides rather narrowly rounded, strongly margined, with a very deep furrow extending down and back to the posterior margin from opposite the lower corner of the eye, the furrow well above the lateral limits of the segment. On one side of the segment there is an additional shorter furrow, a little above the larger one, reaching half across the segment from the back margin.

In this specimen the pits in the transverse depression of the segments extend across the dorsum. Surface shining, with long, fine, longitudinal scratches, the sides of the body not striate beyond the tips of the legs.

Last segment with the apex almost transverse, only slightly produced but still just surpassing the valves. Anal valves smooth and convex, without raised margins; each valve with three setae near the opening. Preanal scale transverse behind, the lateral processes very large and conspicuous. (Fig. 4.)

Until males of this species have been examined its inclusion in the genus *Epinannolene* or any other genus cannot be definitely certified.

Family SPIROBOLIDAE

CUBOCRICUS MAXIMUS spec. nov.

A single male collected in the Cubitas Forest, Ct. Jaronu, June, 1931.

Diagnosis. Differing from its closest relative, *C. suprenans* (Chamb.),

in its slightly larger size, more numerous segments, darker color, unnotched first segment, and the form of the gonopods.

Description. Length 190 mm.; width 19 mm.; number of segments 51. Color deep brown, the posterior border of the segments darker, almost black.

Head smooth except for a short, shallow median furrow on the vertex. Ocelli 25 to 27, in 7 series. Antennal sense cones numerous.

First segment smooth throughout, with only a short, very faint suggestion of a raised margin along each of the broadly rounded sides; the sides almost reach the lower limits of the second segment. Posterior margin not notched above the lateral angles.

Second segment scarcely differing from segment 3, lacking a shoulder or prominence below segment 1.

Succeeding segments strongly shining, the dorsum with a few broad and indistinct longitudinal depressions across the posterior half. Transverse sulcus evident only as far as the pore or slightly above it. First pore far below the level of the other pores. Scobina present from segment 8 to 19, represented by a large coarsely striate area on each side without an anterior pit or depression.

Last segment terminating in a produced, rounded apex not surpassing the valves.

Anal valves with smooth, prominent, raised margins.

Gonopods with the median plate lacking a constriction at the middle as in *suprenans*; the basal portion is heavier and more nearly straight across the bottom; the anterior lateral lobes do not reach as far up the median plate, nor do the posterior lateral lobes exceed it; the inner gonopods are more strongly hooked, and each has a broader, heavier base than *suprenans*. (Fig. 5 & 6.)

First and second pairs of legs stout, the second pair shorter than the first and with the coxae contiguous throughout; coxae of the first legs widely spread by the ventral part of the closely applied head. Third legs with each coxa produced into a rounded lobe. Coxae of legs 4 and 5 with smaller lobes. Tarsal pads conspicuous on legs 3 to 7, decreasing in size behind the gonopods and vanishing at about the twentieth segment.

This is the largest milliped thus far reported from the Western Hemisphere. The females of this species may be found to exceed the males in size.

Family STIODESMIDAE

HETEROPENTE genus nov.

Type: HETEROPENTE PLANIFRONS spec. nov.

Diagnosis. In the possession of pores on segments 5, 7, 10, 13 and 16 this genus differs from other known genera. In other structural characters *Heteropente* seems more distantly related to the Mexican *Decaporedesmus*, with pores on segments 5, 7, 10, 13 and 15, than to *Lophodesmus*, with its 8 poriferous segments.

Description. Body rather short and broad. Dorsum strongly arched; keels somewhat deflexed, projecting a moderate distance from low on the sides of the body. Feet reaching a little beyond the keels. Pores on segments 5, 7, 10, 13 and 16.

Head with the front and vertex merged on the same plane; the former light colored, hispid; the latter dark and roughened. Antennae rather short, geniculate, arising from a deep, recessed depression on each side of the median portion of the head.

First segment hiding the head from above; anterior margin definitely reflexed, with 10 thick, rounded, projecting lobes; disc greatly elevated above the margin, with an anterior row of 4 large rounded tubercles across the middle, a posterior row of 6 tubercles, the inner four of which are similar to those in front but each outer tubercle much smaller.

Second segment with the lateral margin of each keel tri-lobed and as long as the lateral margins of the keels of segments 3 and 4 together. Segments 3 to 19 with the keels bi-lobed, the posterior lobe on the poriferous segments replaced by the prominent pore tubercle. Keels of segments 2, 3 and 4 slightly produced forward; those of segments 5 to 16 at right angles to the body; those of segments 17 and 18 bending backward somewhat while those of segment 19 are directed almost straight back.

On each side of the dorsum of segments 2 to 19 there are 2 rows of three prominent tubercles each; the inner row higher, more distinct and increasingly elevated toward the caudal segments, culminating in a very prominent ridge on segment 19 with its posterior end produced back beyond the tips of the keels; the outer row of tubercles decreases in height very gradually to segment 19 where it still is evident but much less conspicuous than the inner row. (Fig. 7.)

Last segment with 5 marginal lobes, the median or apical one double

the width of any of the others. Dorsal surface with an elongate elevation on each side.

Preanal scale short, broadly triangular.

Gonopods of the usual shape, a large bulbous basal joint containing a more or less modified inner joint.

HETEROPENTE PLANIFRONS spec. nov.

A single male collected from cane field soil at Jatibonico, July 8, 1931.

Description Length 6.5 mm., width 1 mm. Color of the posterior subsegments above and below a dull black; vertex of head to between the bases of the antennae also black; remainder of head, antennae, legs, sterna, anal valves, preanal scale and the anterior subsegments uncolored.

Antennae with joint 5 surpassing the combined length of joints 3 and 4 or 6 and 7.

Gonopods with each terminal joint arising above the bulbous basal joint, trifurcate; the inner branch slender, short; median branch slightly stouter, about as long as the inner branch; outer branch double the length of the inner branches, straight, except at the apex which is bent slightly backward. (Fig. 8.)

Other characters of only specific importance have probably been included in the generic description.

Family CHELODESMIDAE

CUBODESMUS PROXIMUS Chamb.

Cubodesmus proximus Chamb., Bull. Mus. Comp. Zool., **62**, 1918, p. 239.

A single female, not fully colored, collected from beneath stones at Ct. Jaronu, June 24, 1930.

Family STRONGYLOSOMIDAE

ORTHOMORPHA COARCTATA (Sauss.)

Polydesmus coarctatus Saussure, Mem. Soc. Phys. Genève, 1860, p. 39.

Specimens of this widespread species were collected at Jatibonico, Sept. 3, 1931.

Family POLYDESMIDAE

HEXADESMUS genus nov.

Type: HEXADESMUS LATERIDENS spec. nov.

Diagnosis. The 18-segmented body; the large sixth joint of the antennae; the slender sixth joint of the legs arising from what appears to be a long joint but in reality are three joints so closely joined as to appear as one; are the distinguishing features of this genus.

Description. Body small and slender, delicate, loose-jointed, and with but 18 segments. Shape typically Polydesmid.

Head broad, subglobular, densely hispid. Antennae with the third, fourth and fifth joints beadlike, the sixth joint much thicker than any other and nearly as long as the 3 preceding joints together. (Fig. 9.)

First segment narrower than the head but not narrower than the next segments; semicircular, the posterior corners right angled and slightly produced backward. Along the front margin is a row of 8 erect setae, and there also is a median and a posterior row, each containing 4 similar setae.

Ensuing segments with the anterior subsegments much exposed except close to the front of the body; surface coarsely reticulated. Posterior subsegments with the dorsum slightly convex and without a transverse depression; surface almost as coarsely reticulated as the anterior subsegments and with 3 transverse rows of 4 setae each; the outer seta on each side of the middle row is near the lateral margin of the keel; the 4 setae of the posterior row project from the back margin. Keels with the lateral margin finely serrated, the posterior angle definitely produced backward, a seta in the outer margin of the angle and usually one or two in front of it. Pores borne dorsally at the base of the posterior angle on the usual segments except that they terminate on segment 17.

Penultimate segment as wide and longer than the segments preceding it, the lateral margins of the keels scarcely converging backward, almost parallel, the posterior angles longer and more strongly produced. Ventrally there are 8 long setae near the posterior margin.

Last segment long, acutely triangular, the sides converging in 2 straight lines to the apex, which somewhat exceeds the valves but is little or not at all deflexed, the 4 apical setae present. Dorsally there are 2 anterior and 2 posterior erect setae, and on each side there are 2 additional setae.

Anal valves strongly convex, the margins not at all compressed. Preanal scale long, triangular, the 2 apical setae close together.

Legs apparently with but 4 joints, as joints 3 to 5 are so closely joined as to resemble a single piece. (Fig. 10.) Joint 6 very slender as compared to the adjacent joints. Sterna long and wide and very sparsely hispid, the legs widely separated in each direction. There is a series of 8 short setae along the posterior margin of each segment behind the sternum.

HEXADESMUS LATERIDENS spec. nov.

The type, a mature female with but 18 segments, was collected from soil in a sugar-cane field at Jaronu, June 15, 1931. Three young specimens were found in similar locations at Jaronu and Jatibonico in 1931. Other 18-segmented females, indistinguishable from the type, were collected by the writer in St. Kitts and in the island of Carriacou, B. W. I., in 1932, while a member of the Allison V. Armour Expedition.

The type specimen measures 3.8 mm. in length and .3 mm. in width. In life the color probably was white, as in the specimens collected by the writer, but the alcoholic specimens from Cuba are russet brown. The young specimens show the same characters of antennae, legs, dorsum, etc., as the mature specimens, but have fewer segments.

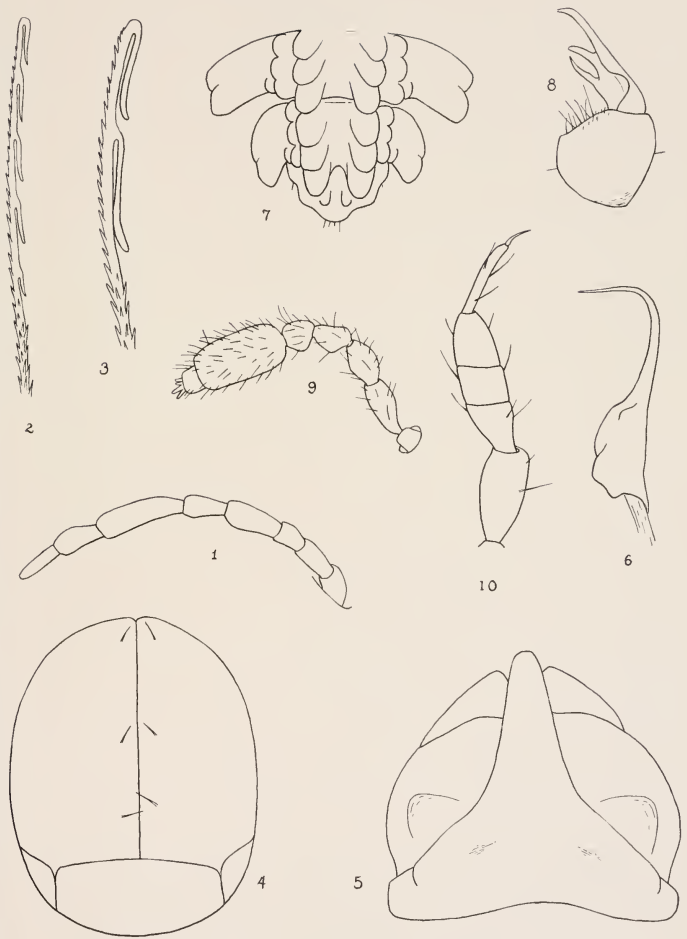
Another even smaller 18-segmented member of this family was discovered in Haiti in 1927 and a description, based on male and female specimens, is being prepared. Belonging to an order typified by millipeds with 20 segments, these 2 species probably represent the lowest stage of degeneracy thus far known in the Merocheta, as no 18-segmented forms have previously been reported and the 19-segmented species, of which there are very few in proportion to the vast aggregate of those with 20 segments, have been looked upon as degenerate forms.

EXPLANATION OF PLATE

EXPLANATION OF PLATE

Polyxenus longisetis Pocock

1. Antenna.
2. Tip of hair from the posterior pencil.
3. Tip of a similar hair, more greatly magnified.
Epinannolene cubensis (Bollman)
4. Anal valves and preanal scale.
Cubocricus maximus Loomis
5. Anterior view of gonopods.
6. Posterior view of an inner gonopod.
Heteropente planifrons Loomis
7. Dorsal view of segments 18, 19 and 20.
8. Outer lateral view of a gonopod.
Hexadesmus lateridens Loomis.
9. Antenna.
10. Leg from near the middle of the body of a specimen from Jatibonico, Cuba.



No. 10. — *The Ornithology of Guerrero, Mexico*

BY LUDLOW GRISCOM

Ornithologists have long known that the State of Guerrero was one of the richest sections of Mexico, which would well repay further investigation. The hot Pacific lowlands are a part of the very distinct fauna closely related to the Central American Arid Tropical Fauna. The lofty Sierra Madre del Sur almost bisects the State into a northern and southern half. It is remarkable for being the meeting ground of three different faunas. Most important of all, perhaps, this mountain range is the northernmost outpost, on the western side of the continent, of the Subtropical Zone of Central America and the Andes. It also proves to be the southern limit of various boreal, Rocky Mountain, or Upper Sonoran types. Finally the many birds characteristic of the table-land of Mexico reach these mountains as one of their western or southwesternmost outposts. These factors combined result in a remarkable assemblage of endemic species and subspecies, and every competent collection made there has yielded a rich harvest of new forms.

The Museum of Comparative Zoölogy was accordingly fortunate in securing the services of the veteran collector W. W. Brown, who happened to be in Mexico City early in 1930 on a free lance expedition. With some difficulty he was persuaded to collect in Guerrero, reached that State in early October and remained until June, 1932. The first six months were spent in the lowlands on both sides of the mountains, and the final year in the mountains around Chilpancingo. Unfortunately Mr. Brown never really collected in high cloud forest, but his collection gained in the thoroughness with which the high pine and oak woods were combed, as the results recorded beyond amply prove. We accordingly purchased his entire Guerrero collection, slightly over 1,500 specimens.

His itinerary was as follows:—

TAXCO. A large town northwest of Iguala. Oct. 9–Nov. 1, 1930 and Nov. 10–15, 1930.

IGUALA. A town on the railroad south of Cuernavaca in Morelos, and well north of the Sierra Madre. Altitude about 3,000 ft. Nov. 5, 1930.

CACALATENANGO. A hamlet in the immediate vicinity of Iguala. Nov. 10 and 11, 1930.

PIÉ DE LA CUESTA. A hamlet at the foot of the mountains in the Pacific lowlands, along the old mule trail from Chilpancingo. Dec. 11-20, 1930.

ACAPULCO. The well-known seaport town. Dec. 15, 1930-Jan. 17, 1931; May 1-8, 1931.

COYUCA. A town in the Pacific lowlands northwest of Acapulco; not to be confused with another town of the same name north of the Sierra Madre in the valley of the Rio de las Balsas. Jan. 15-April 20, 1931.

CHILPANcingo. A city in the mountains at about 4,000 ft. altitude. May 23, 1931-June 7, 1932.

There is practically no ornithological history to Guerrero, as the only two really important collections made there have never been reported on. Lesson records a few birds from Acapulco picked up by his naval brother. Lafresnaye described a bird or two brought from Acapulco by Leclancher, notably the type of *Passerina leclancheri*. Col. Grayson paid Acapulco a flying visit, and his specimens were recorded by Lawrence. Markham also obtained a few birds around Acapulco. These and other scattered records are all brought together by Salvin and Godman in the *Biologia Centrali-Americana*. A really great and thorough collection from representative localities was made for Salvin and Godman by Mrs. H. H. Smith. She visited the Pacific lowlands, the mountains at Chilpancingo and Omilteme, and various parts of the interior. She discovered numerous novelties, particularly in the high mountains. None of her material reached England until 1888. Some of the species she obtained are recorded in the *Biologia*, but we know nothing of the whole oscine Passeres. O. T. Baron followed closely on Mrs. Smith's heels in the mountains. His special object was to secure good series of the rare and new hummingbirds discovered by her, in which he was entirely successful. Hartert reported on these hummers, but if Baron collected other birds, they remain unrecorded. As is well known, Nelson and Goldman travelled extensively but very rapidly through the State on a biological reconnaissance. They wasted no time and nearly doubled the number of known endemic forms from the region. It is they who have always said that the State still awaits thorough exploration.

The collection before me amply demonstrates the correctness of this viewpoint. At the present writing I have found definite records for but 177 birds from Guerrero. To these Brown adds 110, including one new genus, numerous new subspecies, and range extensions for numerous other genera and species, without ever having reached the Sub-

tropical Zone. A glance at the list beyond shows obvious gaps in family after family. Guerrero is still without a Tinamou, scarcely a Swift, a Hawk, or a water-bird. Many Pacific lowland species are well-known from both north and south of Guerrero, and certainly occur there too. Another glance at the map shows how minute a section of the State has been covered by the recorded collecting stations. The Sierra Madre is an important range of considerable length and two different divisions. It rises to over 11,000 ft. No one has really collected above 8,000 ft., and only one section of this range north of Chilpancingo has ever been explored. The varied nature of the terrain in the interior can best be gleaned by reading Gadow's "Through Southern Mexico," (Chaps. XVI-XIX), a delightfully written account by a great naturalist. I venture to predict that not less than 150 species remain to be found in Guerrero, and there is not the slightest ground for supposing that no further interesting novelties await the explorer in the higher mountains. I earnestly hope that this paper will stimulate and not discourage other people from further investigation.

A few words can now be devoted to those species which are definite indicators of either special faunal areas or life-zones.

*Species characteristic of the Subtropical Zone.*¹

* <i>Dendrortyx macrourus striatus</i>	* <i>Xiphocolaptes promeroperhynchus</i>
<i>Dactylortyx thoracicus</i> subsp.	<i>omiltemensis</i>
* <i>Oreopeleia albifacies rubida</i>	<i>Xiphorhynchus erythropygius ery-</i>
<i>Campylopterus hemileucurus</i>	<i>thropygius</i>
* <i>Eupherusa poliocerca</i>	<i>Lepidocolaptes affinis affinis</i>
* <i>Lampornis margarethæ</i>	* <i>Aphelocoma guerrensis</i>
* <i>Lampornis pringlei</i>	* <i>Cyanolyca mirabilis</i>
* <i>Aulacorhynchus prasinus wagleri</i>	* <i>Henicorhina leucophrys festiva</i>
* <i>Grallaria guatemalensis ochraceiventris</i>	* <i>Catharus frantzii omiltemensis</i>
<i>Xenicopoides variegaticeps</i>	<i>Basileuterus belli clarus</i>
* <i>Automolus rubiginosus guerrensis</i>	* <i>Chlorospingus ophthalmicus albifrons</i>
	<i>Buarremon brunneinuchus</i>

This list can advantageously be contrasted with that of Guatemala (cf. Griscom, Birds Guat., p. 54); only 21 species instead of 40. We see a further decrease, therefore, in the development of this Zone, but a similar high degree of endemism, thanks to the isolated islands into which this Zone is broken up throughout Central America. Another factor tends still further to reduce the importance of this Zone in

¹ Endemic forms are marked with an *.

Guerrero. Writing of conditions in Guatemala (*op. cit.*, pp. 56-58), I had occasion to point out that various genera and species, absolutely characteristic of the Subtropical Zone in Central America, were not confined to this Zone in Guatemala (particularly in the western half), but were variously arid tropical or temperate. This state of affairs is increased in Guerrero and other parts of western Mexico. Birds like *Streptoprocne*, *Mitrephanes*, *Myadestes*, *Turdus assimilis*, *Myioborus*, *Atlapetes gutturalis*, and *Tanagra elegantissima* cease to be characteristic of the Subtropical Zone.

*Endemic forms characteristic of the West Mexican
Arid Tropical Fauna*

<i>Crypturus cinnamomeus occidentalis</i>	<i>Cissilopha sanblasiana</i> subsp.
<i>Ortalis vetula poliocephala</i>	<i>Heleodytes capistratus humilis</i>
* <i>Amazona finschi</i>	<i>Pheugopedius felix</i> subsp.
<i>Piaya cayana mexicana</i>	<i>Thryophilus sinaloa</i> subsp.
<i>Morococcyx erythropygus mexicanus</i>	* <i>Turdus rufo-palliatu</i> s
<i>Caprimulgus ridwayi</i>	<i>Polioptila bilineata nigriceps</i>
<i>Anthoscenus constantii leocadiae</i>	* <i>Vireo hypochryseus</i>
<i>Trogon citreolus</i>	<i>Granatellus venustus</i>
<i>Momotus mexicanus</i>	* <i>Cassiculus melanicterus</i>
<i>Centurus chrysogenys</i> subsp.	<i>Icterus pustulatus</i> subsp.
<i>Xiphorhynchus flavigaster mentalis</i>	<i>Pheucticus chrysopheplu</i> s
* <i>Deltarhynchus flammulatus</i>	<i>Sporophila torqueola</i>
<i>Tyrannus crassirostris</i> subsp.	* <i>Cardinalis carneu</i> s
<i>Calocitta formosa formosa</i>	<i>Aimophila humeralis</i>
<i>Xanthoura luxuosa</i> subsp.	<i>Aimophila acuminata</i>
	* <i>Passerina leclancheri</i>

Those species marked with an asterisk are not represented south of the Isthmus of Tehuantepec, the northern limit of the Central American Arid Tropical Fauna, to which the West Mexican is closely related. Further comparisons will prove instructive.

Genera not found south of Isthmus	2
“ “ “ north “ “	2
Species “ “ south “ “	20
“ “ “ north “ “	16
“ common to both areas	38

It will be noted at once that the resemblances between these two areas are much greater than the differences, and we must recall that

we are confining our remarks solely to genera and species which are peculiar to the arid tropics in Middle America. If either of these subdivisions be contrasted with the birds of the Humid Tropical Zone on the Caribbean coast of Vera Cruz or Central America, it will be clear that in the first case we are contrasting two subdivisions of one great faunal area, and in the second case we are contrasting two totally different faunal areas, to the ornithologist two different worlds.

It will be seen then that the West Mexican and the Central American Arid Tropical Faunas bear the same relation to each other, with about the same degree of difference, as the Caribbean Humid Tropical Fauna of Central America does to the Colombian-Pacific Fauna. In both cases there is continuity of climate and habitat. In both cases there is little generic endemism and a high proportion of representative species or subspecies. It is striking and thought-provoking that in both cases a famous isthmus is the approximate boundary between the two pairs of faunas. Common sense might well expect two mountain faunas separated by the lowlands of an intervening isthmus to be still more different. In Middle America, however, the actual facts are reversed. The collector of characteristic Subtropical Zone birds who proceeds from Guatemala to Guerrero will find nothing but representative species and subspecies in the second locality. But if he goes from San José to Acapulco, he will leave some genera and many striking species behind, and find as many others in the new place.

I might add that another aspect of the bird-life of the tropical lowlands of southwestern Mexico is the frequency of racial variation in birds of general distribution in the Tropical Zone. Sometimes this is carried to a still finer point. In Guerrero it is apparent in a few cases that the bird of the interior is racially separable from the bird of the Coastal plain. Presumably the valley of the Rio de las Balsas is the highway up which some tropical birds reach the interior.

The inosculation, however, of tropical and temperate zone birds on the edges of the great Mexican tableland, and the mixture of endemic and boreal types in the higher altitudes is a gigantic zoögeographic problem quite outside the scope of this paper, primarily a report on the birds of Guerrero. The coastal lowlands are in the heart of the West Mexican Arid Tropical Fauna, which has been defined and contrasted with the faunal areas southward. A feeble remnant of the expiring Subtropical Zone of Central America occurs in the mountains. The balance of the bird-life of the State is not a local but a major problem in one of the most complicated land masses of the world.

Systematic List

FAMILY CRACIDAE

ORTALIS VETULA POLIOCEPHALA (Wagler)

Coyuca, 1 ♂, Jan. 26.

I can see no reason for keeping this bird specifically distinct from *vetula*.

FAMILY COLUMBIDAE

COLUMBA FASCIATA FASCIATA Say

Chilpancingo, 1 ♀, May 30.

MELOPELIA ASIATICA MEARNSI Ridgway

Chilpancingo, 1 ♀, Jan. 7.

ZENAIDURA MACROURA MARGINELLA (Woodhouse)

Chilpancingo, 4 ♀, Oct. 27-Jan. 5.

SCARDAFELLA INCA (Lesson)

Chilpancingo, 1 ♂.

COLUMBIGALLINA PASSERINA PALLESCENS (Baird)

Coyuca, 1 ♂, 1 ♀; Chilpancingo, 1 ♂.

COLUMBIGALLINA RUFIPENNIS ELUTA Bangs

Coyuca, 1 ♂, 1 ♀.

LEPTOTILA VERREAUXI ANGELICA Bangs

Chilpancingo, 1 ♂, Oct. 20.

FAMILY CHARADRIIDAE

CHARADRIUS COLLARIS Vieillot

Acapulco, 1 ♂, Dec. 15, 1930.

NUMENIUS HUDSONICUS Latham

Acapulco, 1 ♀, Jan. 1.

TOTANUS FLAVIPES (Gmelin)

Coyuca, 1 ♀, Feb. 6, 1931.

ACTITIS MACULARIA (Linnaeus)

Chilpancingo, 1 ♀, Jan. 7.

FAMILY JACANIDAE

JACANA SPINOSA GYMNOTOMA (Wagler)

Acapulco, 1 ♂, 1 ♀; Pié de la Cuesta, 1 ♀.

FAMILY ARDEIDAE

FLORIDA CAERULEA (Linnaeus)

Acapulco, 1 ♂.

BUTORIDES VIRESCENS VIRESCENS (Linnaeus)

Acapulco, 2 ♀; Pié de la Cuesta, 1 ♀; all in December.

FAMILY ACCIPITRIDAE

ACCIPITER VELOX VELOX (Wilson)

Chilpancingo, 1 ♀, Nov. 15.

BUTEO ALBICAUDATUS HYPOSPODIUS Gurney

Chilpancingo, 1 ♂.

BUTEO MAGNIROSTRIS GRISEOCAUDA (Ridgway)

Coyuca, 1 ♂, 1 ♀.

ASTURINA PLAGIATA PLAGIATA Schlegel

Acapulco 1 ♂; Coyuca, 1 ♀.

FAMILY FALCONIDAE

HERPETOTHERES CACHINNANS CACHINNANS (Linnaeus)

Coyuca, 1 ♂, April 15.

CERCHNEIS SPARVERIA PHALAENA (Lesson)

Acapulco, 1 ♀; Taxco, 1 ♂, 2 ♀; Chilpancingo, 3 ♂, 8 ♀; Oct. 12–March 15.

FAMILY BUBONIDAE

STRIX VARIA SARTORII (Ridgway)

Chilpancingo, 1 ♂, 1 ♀.

BUBO VIRGINIANUS MELANCERUS (Oberholser)

Chilpancingo, 2 ♂, 1 ♀.

CICCABA VIRGATA subsp.

Chilpancingo, 2 ♀.

These birds are quite distinct in being intermediate between *centralis* Griscom of Oaxaca southward, and *squamulata* of northwestern Mexico.¹

SPEOTYTO CUNICULARIA HYPOGAEA (Bonaparte)

Chilpancingo, 1 ♀, Jan. 14.

GLAUCIDIUM BRASILIANUM RIDGWAYI Sharpe

Coyuca, 1 ♀.

GLAUCIDIUM MINUTISSIMUM PALMARUM Nelson

Chilpancingo, 1 ♂, Dec. 3, 1931.

This specimen confirms my opinion that *palmarum* is merely a pale west Mexican representative of *minutissimum gnoma*.

¹ Similar birds have just been described as *C. v. amptonotata* Kelso.

FAMILY PSITTACIDAE

ARATINGA CANICULARIS EBURNIROSTRUM (Lesson)

Acapulco, 2 ♂, 1 ♀; Coyuca, 3 ♂.

AMAZONA ALBIFRONS ALBIFRONS (Sparrmann)

Acapulco, 3 ♀.

FAMILY ALCEDINIDAE

CHLOROCERYLE AMAZONA (Latham)

Acapulco, 1 ♀.

FAMILY MOMOTIDAE

MOMOTUS MEXICANUS MEXICANUS Swainson

Cacalotenango, 1 ♀; Chilpancingo, series of 31.

I can see no constant or trenchant characters in *saturatus* Nelson.

FAMILY CAPRIMULGIDAE

CHORDEILES ACUTIPENNIS TEXENSIS Lawrence

Coyuca, 1 ♂; Chilpancingo, 2 ♂, 1 ♀, Jan. 5–April 27.

NYCTIDROMUS ALBICOLLIS NELSONI Ridgway

Acapulco, 3 ♂; Coyuca, 1 ♀.

CAPRIMULGUS RIDGWAYI (Nelson)

Chilpancingo, 1 ♀, April 30.

FAMILY MICROPODIDAE

CHAETURA VAUXII VAUXII (Townsend)

Taxco, 2 ♂, 1 ♀, Nov. 10, 1930.

FAMILY TROCHILIDAE

SAUCEROTTIA BERYLLINA VIOLA (Miller)

Series of 38 from Taxco and Chilpancingo.

AMAZILIA RUTILA RUTILA (Delattre)

Acapulco 7 ♂, 5 ♀; Coyuca, 1 ♀.

AMAZILIA VIOLICEPS VIOLICEPS (Gould)

Morelos, Cuernavaca, 2 ♂ ad., 2 ♂ imm., 1 ♀ ad.;

Guerrero, Naranjo, 1 ♂ ad.; Taxco, 1 ♂ imm.;

Chilpancingo, 10 ♂ ad., 5 ♀ ad., 18 of both sexes variously immature.

This splendid series, when combined with other series from Jalisco, Sonora and Chihuahua, confirms me in the suspicion I have entertained for years that one of the most remarkable multiplication of species in Hummingbirds has taken place in the west Mexican representatives of this poorly circumscribed genus.

No less than four main specific concepts have been proposed in the *verticalis* group, of which three are definitely recorded from the same geographic area. The character which has been mainly relied upon is the color of the crown, as follows:—

Crown glittering

a. Crown blue = *A. verticalis* auct. nec Lichtenstein = *elliotti* Berlepsch

b. Crown violet = *A. violiceps* (Gould)

Crown dull or dusky

c. Crown greenish = *A. viridifrons* (Elliot)

d. Crown indigo blue = *A. guerrerensis* (Salvin and Godman)

As a matter of fact these variations in crown color are purely questions of sex and age, as is now conclusively proven by the large series before me. The youngest stage is *viridifrons*, the next is *guerrerensis*, both adult males and females have glittering blue crowns (*verticalis*), and only the oldest males are *violiceps*. Mr. Ridgway seems to have suspected this state of affairs, as he definitely reduced *guerrerensis* to the adult plumage of *viridifrons*. It is difficult to understand how this treatment has lasted so long, when the common and most closely related species, *A. cyanocephala* of southeastern Mexico and northern Central America, shows exactly the same crown color variations

according to maturity and sex. These four specific concepts therefore boil down to one species, the earliest name for which is *violiceps* (Gould). Indeed I am by no means sure that *violiceps* is specifically distinct from *cynocephala*. They unquestionably are close representatives, and their ranges come so close to overlapping, that good series from the debatable area in Oaxaca, Puebla and western Vera Cruz will probably produce intermediate or connecting specimens. For the present, however, I am content to treat *violiceps* as specifically distinct.

We may now consider the marked racial variation in *violiceps*. To summarize it, the most northern birds are the dullest and palest, the most southern are the darkest, brightest and greenest. In addition to this, birds from Morelos, Guerrero and Oaxaca have bronze to coppery bronze tails instead of dull greenish bronze tails, and in series of *comparable age and sex*, the crown averages slightly darker or deeper colored, bluer rather than greener in immature specimens, more violet rather than blue in adult males.

With 17 specimens from Jalisco before me representing *elliotti*, another series of 14 from Sonora and Chihuahua prove to be racially separable. They may be known as

AMAZILIA VIOLICEPS CONJUNCTA subsp. nov.

Type. No. 224,112, Mus. Comp. Zoöl.; ♂ ad.; Alamos, southern Sonora, Mexico; Feb. 16, 1888; M. Abbott Frazar.

Characters. Resembling *elliotti* (Berlepsch) of Jalisco and Sinaloa, but crown in adult males noticeably violet rather than deep blue, without any blue or green reflections in the posterior border of the plaque; crown in females and young averaging bluer, less green according to age; both sexes duller colored above, more dusky brownish, less green, particularly noticeable in the tails of adult males.

The races are consequently as follows:—

1. *A. violiceps violiceps* Gould. Includes *viridifrons* Elliot and *guerrerensis* Salvin and Godman as immature stages; and *atricapilla* Simon as an aberration, and *derneddei* Simon as an unnecessary renaming of *viridifrons* Ridgway on the theory that it was not *viridifrons* Elliot, guessed to belong to another group. Range chiefly Oaxaca, Guerrero and Morelos. Relatively darkest, brightest, and greenest; crown plaque averaging more deeply colored; tail bronze to coppery bronze.

2. *A. violiceps elliotti* (Berlepsch). *A. quadricolor* of authors, *nec* Vieillot; *A. verticalis* of authors, *nec* Lichtenstein as to description and

specimen No. 27, the first one mentioned.¹ Southern Sinaloa to Jalisco. Not quite so dark or so bright green; crown lighter colored; tail greenish bronze, never coppery.

3. *A. violiceps conjuncta* Griscom. See above.

There remains one more so-called species to discuss, the unique adult male type of *salvini* (Brewster), which is before me, and which I have never hitherto carefully examined. By inference I had always doubted the existence of another species of this genus in Sonora. Geographically and faunally there is no basis for one, and the failure to duplicate the type in over forty years has further significance, and in part at least strengthens this view. My late esteemed colleague Outram Bangs always supposed that *salvini* was of hybrid origin.

A careful study of the color and structural characters of the type convinces me that *Cyanomyia salvini* Brewster is a hybrid between *Amazilia violiceps conjuncta* and *Cynanthus latirostris* Swainson. These closely related genera differ in (1) *Amazilia* has the frontal feathering extending forward to and partially concealing the nasal operculum; (2) the tail is slightly forked in *Cynanthus*, truncate in the section of *Amazilia* with which we are here concerned. In these respects *salvini* is an *Amazilia* as to the frontal feathering, but the tail is slightly forked as in *Cynanthus*. In size *salvini* resembles the *Cynanthus*, a considerably smaller bird than *A. violiceps*. The color characters combine the two supposed parents perfectly. The glittering violet crown plaque of *violiceps* combined with the plain green of *Cynanthus* produces a glittering bluish green plaque. The green upper back fading to dusky green is a perfect combination of the dusky versus dark green upperparts of the supposed parents. The tail is dark green instead of steel blue versus dull dusky bronzy green, and the feathers have the gray tips of *Cynanthus*. The underparts are white medially as in the *Amazilia*, but the sides of the neck and chest are glittering bluish green, passing to green on the sides and flanks, just as in the *Cynanthus*.²

PHAEOPTILA SORDIDA (Gould)

Series of 64 from Taxco and Chilpancingo.

¹ Hellmayr was the first to point out that Lichtenstein's *verticalis* was really *cianocephala* Lesson. He mentions *three* specimens "in Berlin and Vienna," one of which must have been Lichtenstein's No. 27. He was mistaken, however, in saying that all three specimens were *cianocephala*. Mr. van Rossem kindly informs me that No. 28 is undoubtedly *violiceps* Gould, and his notes describing the bird prove this. Dr. Hellmayr was also mistaken in using three specimens. The name *verticalis* can only be applied to one of the two specimens mentioned in the original description, and it is immaterial to what species a third specimen of Lichtenstein's belongs.

² Long after this was written, I received Mr. Berlioz's excellent paper reviewing this group (Rev. Franc. d'Orn., 1932, no. 1, pp. 129-132). We are in substantial agreement in the reduction of species.

HYLOCHARIS LEUCOTIS LEUCOTIS (Vieillot)

Taxco, 1 ♂; Chilpancingo, 1 ♂.

CYNANTHUS LATIROSTRIS Swainson

Taxco, 1 ♂.

CYNANTHUS DOUBLEDAYI (Bourcier)

Acapulco, 1 ♂, Coyuca, 2 ♂, 1 ♀.

CHLOROSTILBON AURICEPS (Gould)

Chilpancingo, 5 ♂, 2 ♀.

COLIBRI THALASSINUS (Swainson)

Taxco, 1 ♂.

EUGENES FULGENS (Swainson)

Taxco, 2 ♂, 2 ♀.

CYANOLAEMUS CLEMENCIAE CLEMENCIAE (Lesson)

Taxco, 1 ♂, Oct. 27, 1930.

LAMPROLAIMA RHAMI RHAMI (Lesson)

Chilpancingo, 1 ♂.

ANTHOSCENUS CONSTANTII LEOCADIAE (Bourcier and Mulsant)

Coyuca, 1 ♀.

TILMATURA DUPONTII DUPONTII (Lesson)

Chilpancingo, 1 ♂, 2 ♀; Taxco, 2 ♂, 2 ♀.

ARCHILOCHUS COLUBRIS (Linnaeus)

Chilpancingo 7 ♂, 2 ♀, Taxco, 1 ♂, 1 ♀; Aug. 20–Oct. 23.

ARCHILOCHUS ALEXANDRI (Bourcier and Mulsant)

Chilpancingo, 1 ♂, Feb. 5, 1932.

CALOTHORAX LUCIFER (Swainson)

Taxco, 1 ♀; Chilpancingo, 1 ♂, 3 ♀, Oct. 17-Jan. 4.

CALOTHORAX PULCHER (Gould)

Chilpancingo, 2 ♂, 2 ♀.

SELASPHORUS PLATYCERCUS PLATYCERCUS (Swainson)

Taxco, 1 ♀, Nov. 1, 1930.

SELASPHORUS RUFUS (Gmelin)

Chilpancingo, 1 ♀, Jan. 14; Taxco, 2 ♂, 1 ♀, Oct. 14-Nov. 1.

STELLULA CALLIOPE LOWEI subsp. nov.

Type. No. 163518. Mus. Comp. Zoöl.; ♂ ad.; Taxco, Guerrero, Mexico; Oct. 25, 1930; W. W. Brown.

Characters. Adult male strikingly distinct from typical *calliope* in having a shorter less full gorget, rose or pinkish lilac in color, instead of rich lilac purple.

Remarks. Gould's description of *Stellula calliope* was based on birds collected by Floresi (presumably) in the Valley of Mexico, where the species is a winter visitant only, so far as we know. The presence of the species in Guerrero has rested hitherto on a female collected by Mrs. Smith in August. The two males from Guerrero were so distinct from western United States specimens that I sent one male of each type to Dr. Lowe of the British Museum, asking him to compare them with Gould specimens from the type locality. He was so kind as to do so, and writes that the two Gould males "unquestionably seem to me to belong to the category with richer, fuller and longer gorget, as in your western United States specimen."

In recognition of his courtesy on this and previous occasions, I take pleasure in dedicating the new form to him.

FAMILY TROGONIDAE

TROGON CITREOLUS Gould

Coyuca, 3 ♂, 1 ♀.

TROGON MEXICANUS Swainson

Chilpancingo, 5 ♂, 2 ♀.

FAMILY CUCULIDAE

COCYZUS MINOR PALLORIS Ridgway

Chilpancingo, 1 ♀, Jan. 24, 1932.

It is certainly astonishing to find a Mangrove Cuckoo so far from the Coast.

PIAYA CAYANA MEXICANA (Swainson)

Chilpancingo, 3 ♂, 1 ♀.

GEOCOCYX VELOX (A. Wagner)

Chilpancingo, 1 ♂, 1 ♀.

MOROCOCCYX ERYTHROPYGUS MEXICANUS Ridgway

Coyuca, 3 ♀.

CROTOPHAGA SULCIROSTRIS SULCIROSTRIS Swainson

Coyuca, 1 ♀; Chilpancingo, 2 ♂, 3 ♀.

FAMILY PICIDAE

COLAPTES CAFER MEXICANUS Swainson

Chilpancingo, 3 ♂, 2 ♀.

The race *mexicanus* is a small and dark extreme of the species, inhabiting the whole southern half of Mexico. It is quite different from the large, pale *collaris* of the western United States south to Sonora and Chihuahua. In northeastern Mexico there proves to be a very small, very pale extreme described below.

COLAPTES CAFER NANUS subsp. nov.

Type. No. 98788, Mus. Comp. Zoöl.; ♂ ad.; Ipina, San Luis Potosi, Mexico; Nov. 30, 1924; W. W. Brown.

Characters. Differing radically from every described race of the Red-shafted Flicker in being smaller even than *mexicanus* Swainson of southern Mexico, and a much paler greyer brown above even than *collaris* (Vigors) of the western United States.

Remarks. The characters given above are based on winter specimens in fresh plumage compared with similar material of *mexicanus* and *collaris*. A worn young August specimen is naturally less easily distinguishable on color characters, and fledglings from San Luis Potosi are not separable in color from *collaris*.

Measurements of Wing

<i>mexicanus</i>	5 ♂, 152 -161 (158)
<i>nanus</i>	4 ♂, 144.5-150 (146.0)
<i>collaris</i>	20 ♂, 160 -174 (168.3)

Material Examined

<i>mexicanus</i>	— small series from Vera Cruz and Guerrero
<i>collaris</i>	— very large series from western United States and Chihuahua.
<i>nanus</i>	— Tamaulipas; Victoria, 1 ♀. San Luis Potosi: Alvarez, 1 ♀ yg; San Luis Potosi, 1 ♂ ad., 4 nestlings; Bocas, 1 ♂; Ipina 2 ♂.

BALANOSPHYRA FORMICIVORA FORMICIVORA (Swainson)

Chilpancingo, 2 ♂, 1 ♀.

CENTURUS CHRYSOGENYS FLAVINUCHUS Ridgway

Coyuca, 6 ♂, 2 ♀.

SPHYRAPICUS VARIUS VARIUS (Linnaeus)

Chilpancingo, 1 ♂, 1 ♀, March 9 & 25.

DRYOBATES VILLOSUS JARDINI (Malherbe)

Chilpancingo, 1 ♂, 3 ♀.

DRYOBATES SCALARIS AZELUS Oberholser

Chilpancingo, 1 ♂, 3 ♀.

CEOPHLÆUS LINEATUS SCAPULARIS (Vigors)

Coyuca, 2 ♂.

FAMILY FORMICARIIDAE

GRALLARIA GUATIMALENSIS OCHRACEIVENTRIS Nelson

Chilpancingo, 1 ♂.

FAMILY DENDROCOLAPTIDAE

XIPHOCOLAPTES PROMEROPIRHYNCHUS OMILTEMENSIS Nelson

Chilpancingo, 1 ♂.

XIPHORHYNCHUS FLAVIGASTER MENTALIS (Lawrence)

Coyuca, 1 ♀.

LEPIDOCOLAPTES LEUCOGASTER (Swainson)

Chilpancingo, 1 ♀.

LEPIDOCOLAPTES AFFINIS AFFINIS (Lafresnaye)

Chilpancingo, 4 ♂, 2 ♀.

FAMILY COTINGIDAE

PLATYP SARIS AGLAIAE ALBIVENTRIS (Lawrence)

Acapulco, 1 ♀; Coyuca, 2 ♂, 2 ♀; Chilpancingo, 1 ♂, 1 ♀.

The Chilpancingo specimens and another from Cuernavaca, Morelos show a distinct approach to typical *aglaiae*.

TITYRA SEMIFASCIATA GRISEICEPS Ridgway

Chilpancingo, 1 ♂.

FAMILY TYRANNIDAE

ELAINEA PLACENS JALISCENSIS (Nelson)

Chilpancingo, 6 ♂, 8 ♀.

This little known race is apparently based on three males from two localities in Jalisco, and the species is unrecorded between there and

Vera Cruz. The occurrence of any form in Guerrero is, therefore, a matter of some geographic interest. The excellent series before me fully confirms the validity of *jaliscensis*. This subspecies differs from typical *placens* in the larger size (wing of males 67.5-72, average 70; female 3 mm. less); the slenderer bill, noticeable at a glance; the paler yellow below; and the greyer cast to the olive green areas.

CAMPTOSTOMA IMBERBE Sclater

Chilpancingo, 2 ♂, 2 ♀; Naranjo, 1 ♀.

I have now seen excellent series of this little flycatcher both in New York and Cambridge from every section of its range, including the types of *ridgwayi* Brewster and 15 other specimens from Sonora, Chihuahua and southern Arizona. The more material I have seen, the more Ridgway's judgment in not recognizing *ridgwayi* has been confirmed. This little bird, living as it does mostly in thorny scrub, is particularly susceptible to wear. Fresh specimens (September to November) are distinctly olive above and yellowish below. By January these color tones have about half gone, and worn breeding specimens are sometimes little more than greyish above and whitish below. In the northern half of the range the bird is chiefly a summer migrant and fresh fall specimens (October & November) are scarce or lacking in collections. In Central America, however, worn breeding birds are equally scarce, as collectors have uniformly avoided the tropics at this season. July and August specimens from Progreso, Guatemala, however, collected by A. W. Anthony cannot be distinguished from the series from Sonora before me. My friend van Rossem has recently urged the recognition of *ridgwayi* (Proc. Biol. Soc. Wash., 43, 1930, pp. 129-130). He also does not believe in any color difference, and points out with his usual acumen, the apparent existence of two color phases, a greyer and a more olive one, apart from the changes due to wear outlined above. He urges, however, size characters to separate northwestern specimens, and presents a table of measurements which would certainly prove his point did it hold on the basis of additional material. I have measured at least five times as many specimens as the 6 males on which he bases his measurements for *imberbe*, and double the number of *ridgwayi*. I have specimens of *imberbe* before me the wing up to 56.6 mm. and others representing *ridgwayi* down to 53.0. The name *imberbe* is based on specimens from Vera Cruz, and birds from southern and eastern Mexico and Texas run

52-56.5, the average 54.5, as against 55.5 for *ridgwayi*. Series from Nicaragua and northwestern Costa Rica run 50-52, and it is here that we have a definitely slightly smaller bird. It seems to me, therefore, that the small southern extreme is more clearly separable from Vera Cruz topotypes than are Arizona birds. No one questions either the differences between the extremes, proved by ample series, or the partial intermediacy of Vera Cruz topotypes. Unfortunately there is no comparable series of sexed topotypes in existence, and we have yet to discover whether typical *imberbe* goes better with the larger northern or the small southern race. It seems to me that the recognition of *ridgwayi* could await this evidence.

The Beardless Flycatcher is apparently unrecorded in western Mexico between Jalisco and the interior of Oaxaca.

MYIOZETETES SIMILIS SUPERCILIOSUS (Bonaparte)

Acapulco, 1 ♂; Coyuca, 1 ♂.

These two specimens show a slight approach to *primulus* van Rossem of Sinaloa and Sonora, but are much nearer *superciliosus*.

PYROCEPHALUS RUBINUS MEXICANUS (Sclater)

Chilpancingo 6 ♂, 1 ♀.

With very large series before me, specimens from northern Sonora and Chihuahua, Lower California and Arizona have a wing which averages about 4 mm. shorter than examples from southern Texas, Tamaulipas, San Luis Potosi and Vera Cruz. In the latter state specimens from the east slope of the mountains approach *blatteus* in characters, while birds from Tabasco and Quintana Roo should be referred to *blatteus*. In which of these series of slight variables the type of *mexicanus* belongs still remains to be determined.

MYIOCHANES PERTINAX PERTINAX (Cabanis & Heine)

Chilpancingo, 4 ♂, July-Dec. 1931.

MYIOCHANES PERTINAX PALLIDIVENTRIS (Chapman)

Chilpancingo, 1 ♂, March 12, 1932.

One of the very few winter records of this subspecies.

MYIOCHANES VIRENS (Linnaeus)

Chilpancingo, 1 ♂, April 30, 1932.

Not previously reported from southwestern Mexico.

MYIOCHANES RICHARDSONII RICHARDSONII (Swainson)

Chilpancingo, 1 ♂, 5 ♀, May 23–July 7, 1931.

These are all slightly worn birds, and constitute a notable extension of the breeding range. In both size and color they do not show the slightest approach to *sordidulus*.

EMPIDONAX TRAILLII BREWSTERI Oberholser

Acapulco, 1 ♂, May 7, 1931; Chilpancingo, 1 ♀, April 30, 1932; Coyuca, 5 ♂, 5 ♀, Feb. 11–March 20, 1931.

EMPIDONAX MINIMUS (Baird)

Coyuca, 4 ♂, 3 ♀, Feb. 6–April 7, 1931; Chilpancingo, 2 ♂, 2 ♀, Oct. 13, 1931–Jan. 17, 1932; Acapulco, 1 ♀, Jan. 5, 1931.

EMPIDONAX HAMMONDI (Xantus)

Chilpancingo, 1 ♀, Nov. 15, 1931.

EMPIDONAX WRIGHTII Baird

Yautepec (Morelos), 1 ♀, Nov. 27, 1930; Taxco, 3 ♂, 1 ♀, Oct. 8–Nov. 10, 1930; Chilpancingo, 10 ♂, 8 ♀, Oct. 5, 1931–May 23, 1932.

Three of the Chilpancingo birds are noticeably paler both above and below, are of maximum dimensions, with distinctly longer and narrower bills. In other words they are exactly intermediate between *wrightii* and a series of *griseus* in fall plumage.

EMPIDONAX FULVPECTUS PULVERIUS Brewster

Chilpancingo, 1 ♀, April 5, 1932.

This specimen confirms me in my belief that Guerrero birds are not true *fulvpectus* Lawrence, as recorded by Sclater & Salvin.

EMPIDONAX DIFFICILIS BAIRDI Slater

Coyuca, 1 ♂, Jan. 29, 1931; Chilpancingo, 1 ♀, Oct. 27, 1931.

These two birds and another winter specimen recently received from Morelos increase the presumption that *salvini* Ridgway is nothing but the winter plumage of *difficilis bairdi* (Cf. Birds of Guatemala, p. 264).

EMPIDONAX ALBIGULARIS ALBIGULARIS Slater & Salvin

Coyuca, 1 ♂, 2 ♀, Feb. 6–March 20, 1931.

These specimens confirm the characters ascribed to typical *albigularis*. They are in worn plumage, so that in color characters they resemble *E. t. traillii* to an astonishing degree, but can, of course, be separated by their very different proportions.

MYIARCHUS TYRANNULUS MAGISTER Ridgway

Chilpancingo, 3 ♂, 1 ♀, March 27–June 8; Coyuca, 1 ♂, Feb. 10.

MYIARCHUS TUBERCULIFER QUERULUS Nelson

Cacalotenango, 1 ♀; Acapulco, 2 ♂; Coyuca, 2 ♀; Chilpancingo, 5 ♂, 1 ♀.

Taken throughout the year, the series including breeding birds both from the lowlands and the mountains. The resident form.

MYIARCHUS TUBERCULIFER OLIVASCENS Ridgway

Coyuca, 4 ♂, 5 ♀, Jan. 15–March 17, 1931; Acapulco, 1 ♀, Dec. 30, 1930.

Apparently a common winter resident, previously obtained near Acapulco and Papayo (April 16). Easily separable from *querulus* in its much smaller size, and usually paler coloration.

MYIODYNASTES LUTEIVENTRIS LUTEIVENTRIS Slater

Coyuca, 1 ♂, April 20, 1931.

MYIARCHUS CINERASCENS CINERASCENS (Lawrence)

MYIARCHUS CINERASCENS INQUIETUS Salvin & Godman

The relationships between *nuttingi*, *inquietus* and *cinerascens* prove to be so remarkable and so complicated that I have devoted nearly a

week to the careful study of the extensive material now available, but I am still unsatisfied as to the proper explanation.

In my recent Guatemala report I suggested that *inquietus*, previously treated as a northern subspecies of *nuttingi*, be reduced to synonymy. A year after this was written, I read Mr. van Rossem's report on his Sonora collections (Trans. San Diego Soc. Nat. Hist., 6, 1931, p. 260). Herein he announces the intergradation of *cinerascens* and *inquietus*, and regards the latter as racially distinct from *nuttingi*. The receipt of 67 specimens from Guerrero, and the re-examination of all other material in the Museum convinces me that this treatment is entirely permissible at the present time, though the facts presented below admit of an alternate explanation.

1. *Myiarchus cinerascens cinerascens* — a large, relatively pale bird, with the outer primary longer than the fourth, the upper tail coverts never rufescent in marked contrast to the back; tip of inner web of outer tail feathers sooty, sometimes extending down the shaft as a narrow streak, but always expanding abruptly terminally. Wing of males 98-105; females 92-100; the tail 5-7 mm. shorter than wing.

United States, 45 ♂, 25 ♀

Sonora, Oposura, breeding, 5 ♂, 2 ♀

“ La Chumeta, “ , 3 ♂, 2 ♀

“ Nacosari, March, 2 ♂

“ Opodepe, breeding, 1 ♂

“ Guaymas, winter, 4 ♂, 2 ♀

Sinaloa, Escuinapa, 1 ♀

Guerrero, Coyuca, 1 ♀

“ Taxco, 2 ♂

“ Naranjo, 1 ♂, 3 ♀

“ Chilpancingo, 3 ♂, 3 ♀

Guatemala, 2 ♂, 1 ♀

2. Birds exactly like typical *cinerascens* in every way, except that outer primary is *equal* to fourth; wing of males 96-100.

Sonora, Guaymas, winter, 1 ♂

Guerrero, Chilpancingo, breeding, 1 ♂ (wing 99)

“ “ winter, 2 ♂

“ Naranjo, “ 1 ♂, 1 ♀

“ Coyuca, “ 1 ♂, 3 ♀

“ Taxco, “ 1 ♀

“ Cacalotenango, “ 1 ♀

3. Birds exactly like typical *cinerascens*, but outer primary notably *shorter* than fourth

Sonora, Guaymas, winter, 1 ♂, 1 ♀

4. Birds quite different from *cinerascens* in some respects; more olive brown; less grey above; the yellow of belly averaging deeper and the upper tail coverts strongly rufescent; outer primary always shorter than fourth; tail pattern exactly as in *cinerascens*; size smaller, wing, ♂ 88-97; ♀, 90.5-95. Guerrero, 8 ♂, 15 ♀, from various localities, including breeding birds from Chilpancingo.

5. Birds exactly like the last, but dusky area on tip of inner web of outer tail feather greatly reduced and not so abruptly expanded.

Guerrero, Chilpancingo, 3 ♀, breeding

6. Birds from Guerrero, the type locality, corresponding in every way to the original description of *inquietus*; differing from section 4 in averaging smaller, in having a dusky shaft stripe along inner web of outer tail feather for at least the terminal half, never abruptly expanded at tip and rarely wanting; size smaller, wing of ♂, 87-95; ♀, 82.5-89.

Guerrero, 8 ♂, 8 ♀ from Chilpancingo and Coyuca, including breeding adults and juveniles.

Sonora, Alamos, 4 ♂, 3 ♀, February and March.

Chihuahua, Carmen, 1 ♂, 1 ♀, November.

“ Durazno, 1 ♂, 1 ♀, fall.

“ Hacienda de San Rafael, 2 ♂, 1 ♀, 2 nestlings, late May.

Oaxaca, 10 ♂, 15 ♀, of which seven have no shaft stripe.

7. Much smaller birds, the majority with a dusky shaft stripe, nearest *nuttingi*; wing ♂, 82.5-85; ♀, 81-83.5.

Guatemala, Pacific slope, 3 ♂, 11 ♀.

8. Equally small birds with no dusky shaft stripes whatever; typical *nuttingi*.

Guatemala, arid interior 10 ♂, 6 ♀.

Nicaragua, breeding, 4 ♂, 4 ♀ (wing ♂ 84-87).

Costa Rica 3 ♂, 2 ♀ (wing ♂ 82-87).

It will be apparent to anyone who has followed the eight sections given above, that there is complete intergradation of characters from *cinerascens* to *nuttingi* in the ordinary sense. In the geographic sense, however, there is not, in that there is no geographic area occupied by intermediates in between the ranges of *cinerascens* and *inquietus*. The remarkable fact about my great series from Guerrero is that at Chilpancingo, practically the type locality for *inquietus*, *cinerascens*, *inquietus*, and three out of the four intermediate or connecting stages *all breed together*, and that the series of intermediates is far larger than of typical *inquietus*. Such anomalous facts as these strongly raise the presumption of hybridization of two different species. And yet I feel

that even more material and competent field experience above all is needed. It is not demonstrated beyond possibility that the worn, supposedly breeding birds in late May might not represent late spring stragglers. I should prefer to have a competent ornithologist, acquainted with the problem, collect in Guerrero during the breeding season and dissect a good series of specimens himself.

The series as a whole demonstrates the relative inconstancy of the tail markings, and I endorse the remarks previously made by Bangs and Peters and myself in impugning the subspecies *inquietus*, when based on this character alone. The dusky shaft stripe along the inner web of the outer primary is frequently absent in Oaxaca and Guerrero, and rarely even in Sonora. But van Rossem is entirely correct in the larger size of all birds from the Isthmus of Tehuantepec northward, and the name *inquietus* must apply to these birds.

There are further complications with the little known *Myiarchus brachyurus* Ridgway. In Costa Rica and Nicaragua, where Miller and I collected a good series of breeding birds of both species, it is apparent that there are two species occurring together. The small one is of course *nuttingi*, but *brachyurus* sex for sex, proves to be absolutely larger, with a much shorter tail in proportion. This shows convincingly only in a table of individual measurements, but roughly speaking the tail of any *nuttingi* is about 5 mm. shorter than its wing, and the tail of any *brachyurus* is 10-12 mm. shorter than the wing. Mr. Ridgway did not appreciate this point in his treatment of *brachyurus*. It follows that the large *inquietus* in western Mexico have a wing length every bit as big as *brachyurus* in Nicaragua, and they are distinguishable only in their proportionately longer tails. It also follows that old records of *brachyurus* north to Chiapas require checking.

I have carefully measured the tail length of every specimen listed above from Mexico, and there is none in which the tail is sufficiently short proportionately to be *brachyurus*. On the other hand the great majority of specimens, including even typical *cinerascens*, have tails which average 7-8 mm. shorter than the wing. This in part at least nullifies the absolute differences in proportions so readily discernible in Central America. I am equally at a loss how to express this added factor taxonomically.

TYRANNUS VERTICALIS Say

Chilpancingo, 8 ♂, 9 ♀, Oct. 22-May 19; Iguala, Nov. 5, 1930.

There is only one mid-winter specimen, so I presume that the majority of individuals of this species proceed further south.

TYRANNUS VOCIFERANS VOCIFERANS Swainson

Chilpancingo, 4 ♂, 4 ♀, Oct. 21–April 17.

Several of these specimens are quite typical of northern Cassin's Kingbird, but several are intermediate and may well represent the breeding bird of Durango and Jalisco.

TYRANNUS VOCIFERANS XENOPTERUM subsp. nov.

Type. No. 163725, Mus. Comp. Zool., ♂ ad., Chilpancingo, Guerrero; June 29, 1931; W. W. Brown.

Characters. Differing from typical *vociferans* in averaging slightly smaller, upperparts slightly darker and less olive green, more grey; throat darker and greyer, in sharper contrast with the whiter throat and yellow abdomen; female without any emargination on the outer primaries, the male with only 4 outer primaries distinctly emarginate, far less incised and never so abruptly in fully adult breeding birds.

Measurements of wing. *Vociferans*, large series, ♂ 130–137 (133); ♀ 121–131.5 (126.5); *xenopterum*, 6 ♂ 126.5–130.5 (129); 6 ♀, 119–124 (122).

Remarks. The discovery that Cassin's Kingbird breeds south to Guerrero is an interesting range extension. Of my twelve specimens, eight were collected in late May, June and early July. The other four are fall and winter specimens, showing that the race is resident in part at least. Typical *vociferans* is based on winter migrants in the Valley of Mexico, where there is no evidence whatever that the bird breeds. The new form is abundantly distinct.

TYRANNUS MELANCHOLICUS OCCIDENTALIS Hartert & Goodson .

Acapulco, 1 ♂, 1 ♀; Coyuca, 1 ♂, 3 ♀; Chilpancingo, 1 ♀; all seasons.

TYRANNUS CRASSIROSTRIS CRASSIROSTRIS Swainson

Coyuca, 1 ♂, 5 ♀; Acapulco, 3 ♀; Chilpancingo, 4 ♂, 7 ♀, breeding series and late October only.

These birds are all clearly *crassirostris* in color, but average slightly smaller than Oaxaca specimens.

TYRANNUS CRASSIROSTRIS POMPALIS Bangs & Peters

Chilpancingo, 1 ♂, March 14, 1932.

Clearly the northern form in color and size. Undoubtedly a migrant.

FAMILY HIRUNDINIDAE

TACHYGINETA THALASSINA LEPIDA Mearns

Chilpancingo, 2 ♂, Dec. 3 and 11, 1931.

STELGIDOPTERYX RUFICOLLIS SALVINI Ridgway

Chilpancingo, 2 ♂, 1 ♀, April 30 and May 26; wings of ♂ 116.5 and 119 mm.

These birds are really intermediate between *salvini* and *serripennis*, but are referred here on the basis of their longer wings, the most trenchant character in breeding birds.

STELGIDOPTERYX RUFICOLLIS SERRIPENNIS (Audubon)

Coyuca, 2 ♂, 2 ♀, March 17–April.

These are surprising birds and doubtfully referred to *serripennis*. All four are slightly darker than specimens from the eastern United States, and their measurements run below the minimum record for *serripennis*. One suspects the possibility of a local breeding race.

FAMILY CORVIDAE

CALOCITTA FORMOSA FORMOSA (Swainson)

Coyuca, 7 ♂, 3 ♀, Pié de la Cuesta, 1 ♂; Acapulco, 2 ♂, 2 ♀.

CISSELOPHIA SAN-BLASIANA PULCHRA Nelson

Coyuca, 6 ♂, 6 ♀; Acapulco, 3 ♂, 1 ♀.

APHELOCOMA CALIFORNICA REMOTA subsp. nov.

Type. No. 163815, Mus. Comp. Zoöl., ♀ ad.; Chilpancingo, Guerrero, Mexico; Oct. 27, 1931; W. W. Brown.

Characters. In part connecting *sumichrasti* Ridgway with *grisea* Nelson, in other respects different from any known Mexican subspecies of the group; head and neck light cerulean blue, not dull azure as in *cyanotis*, *sumichrasti* and *texana*, nor greyish cerulean as in *grisea*; back hair brown abruptly contrasted with blue of hind neck, as in *sumichrasti*, but unique in having lighter shaft streaks; superciliary stripe

about as in *cyanotis* and *sumichrasti*; loreal, orbital and auricular regions velvety black in sharp contrast with adjacent blue areas, a unique character; underparts whiter even than in *texana* and *sumichrasti*, with fainter streaking on throat and a barely perceptible wash of faint greyish brown on chest and sides, in this respect one extreme of the group; size large as in *sumichrasti*.

This very distinct new form is based on twenty-four specimens from the type locality, the great majority being breeding adults or young of the year. It is quite surprising to find that no member of this group of the genus *Aphelocoma* is recorded from Guerrero.

A few years ago the new form would have been treated as a species. I entirely agree with Oberholser, however, that *cyanotis*, *grisca* and *sumichrasti* are best treated as representatives of *californica* (cf. Condor, 1917, pp. 94-95).

CYANOCITTA STELLERI CORONATA (Swainson)

Chilpancingo, 8 ♂, 9 ♀, throughout the year.

This fine series does not differ constantly in color from *coronata* from Vera Cruz, but averages about 4 mm. shorter in the wing, not a sufficient difference for taxonomic separation.

FAMILY SITTIDAE

SITTA CAROLINENSIS MEXICANA Nelson & Palmer

Chilpancingo, 1 ♂, 1 ♀, April and May 19.

FAMILY CERTHIIDAE

CERTHIA FAMILIARIS JALISCENSIS Miller & Griscom

Chilpancingo, 1 ♂, 1 ♀, 1 juv., breeding season.

The only adult male is browner above and very small compared to *alticola*. The Creeper is previously unknown in Guerrero.

FAMILY TROGLODYTIDAE

HELEODYTES CAPISTRATUS HUMILIS (Sclater)

Acapulco, 4 ♂, 7 ♀; Coyuca, 6 ♂, 5 ♀.

A remarkably variable bird in the amount and intensity of rufous on the back. A long series from Oaxaca are apparently greyer, less rufous above, but they are not seasonably comparable. I cannot regard *humilis* as specifically distinct from the *capistratus-rufinucha* group.

HELEODYTES JOCOSUS JOCOSUS (Sclater)

Chilpancingo, 11 ♂, 10 ♀.

I have no topotypes from Oaxaca to compare with this fine series, but Ridgway found no differences. I do not consider *gularis* (Sclater) of northwestern Mexico specifically distinct.

PHEUGOPEDIUS FELIX FELIX (Sclater)

Coyuca, 1 ♂, 1 ♀.

PHEUGOPEDIUS FELIX PALLIDUS (Nelson)

Chilpancingo, 5 ♂, 4 ♀.

These birds from the interior are noticeably paler and greyer, even in fresh plumage, than Coyuca and Oaxaca specimens, and agree with a specimen from Tepic, which presumably represents *pallidus*.

TROGLODYTES AEDON PARKMANII Audubon

Taxco, 1 ♀, Oct. 16, 1930; Chilpancingo, 4 ♂, Dec. 19–April 5, 1932.

TROGLODYTES BRUNNEICOLLIS BRUNNEICOLLIS (Sclater)

Chilpancingo, 1 ♂.

This montane wren is not well represented in most collections, and the large series in this museum has never been worked up, in default of adequate material of typical *brunneicollis*. Thanks to the authorities of the American Museum of Natural History in New York I have before me a series from Vera Cruz, Puebla and Mexico, and interesting variations become evident. Subspecific variation takes the usual form in Mexican birds and would appear to be approximately as follows.

1. Typical *brunneicollis* Sclater is a richly colored extreme of southeastern Mexico (Mexico, Puebla, Vera Cruz, Oaxaca¹). The upper-

¹ I have not seen the race *nitidus* Nelson from the humid forests of Mt. Zempoaltepec, north-eastern Oaxaca, described as being darker and more richly colored than typical *brunneicollis* from near Oaxaca City.

parts are rich broccoli to mars brown, distinctly rufescent on rump and upper tail-coverts; there are very small, mostly concealed, white spots on the lesser wing coverts; throat and breast rich cinnamon-buff in more or less sharp contrast with the nearly white center of abdomen; barring on flanks and abdomen sharply contrasted, black and white; 12 specimens examined. The Guerrero specimen is markedly greyer and duller brown above, thus partially approaching the next race.

2. *Troglodytes brunneicollis compositus* subsp. nov.

Type. No. 49657, Mus. Comp. Zool.; ♂ ad.; Galindo, Tamaulipas, Mexico; March 25, 1909; F. B. Armstrong.

Characters. Duller and paler than typical *brunneicollis*; upperparts nearest Prout's brown, greyer on the pileum, but rump distinctly rufescent; underparts more uniform, dull cinnamon on throat and breast, the center of abdomen less white; barring on flanks and abdomen duller, less contrasted black and white.

Material. 18 specimens from Tamaulipas, San Luis Potosi and Nuevo Leon. A specimen from Monterey, Nuevo Leon approaches typical *brunneicollis* is being warmer brown above.

3. *Cahooni* Brewster. Still paler and duller; greyish brown above, inclining to mars brown on the rump; spots on lesser wings coverts larger and more abundant; pale cinnamon below, whitish again on center of abdomen; barring on flanks and abdomen much fainter and duller. 60 specimens from Sonora and Chihuahua. A specimen from Jalisco is intermediate. Immature birds of all three races are more richly colored than adults, but differ relatively in the same respects.

HENICORHINA LEUCOPHRYS FESTIVA Nelson

Chilpancingo, 1 ♀.

SALPINCTES OBSOLETUS OBSOLETUS (Say)

Chilpancingo, 6 ♂, 11 ♀, throughout the year; Taxco, 1 ♂.

As mentioned in my Guatemala report, I am unable to recognize a Mexican race *notius* Ridgway.

CATHERPES MEXICANUS MEXICANUS (Swainson)

Chilpancingo, 2 ♂, 1 ♀; Taxco, 1 ♀.

FAMILY MIMIDAE

TOXOSTOMA CURVIROSTRE CURVIROSTRE (Swainson)

Chilpancingo, 1 ♂.

MELANOTIS CAERULESCENS EFFUTICIUS Bangs & Penard

Chilpancingo, 8 ♂, 6 ♀.

This series is slightly intermediate, but on the whole nearer the pale northwestern race. Birds from Vera Cruz are the other extreme of dark and dull coloration, but topotypes are not so extreme.

MIMUS POLYGLOTTOS LEUCOPTERUS (Vigors)

Acapulco, 1 ♂; Chilpancingo, 7 ♂, 22 ♀, Oct. 5–April 26.

FAMILY TURDIDAE

MYADESTES OBSCURUS OCCIDENTALIS Stejneger

Chilpancingo, 1 ♀.

Ridgway refers the Guerrero bird to typical *obscurus*, but as I understand the races (cf. Birds of Guatemala, p. 303), the specimen listed above is typical of *occidentalis*.

TURDUS RUFO-PALLIATUS Lafresnaye

Coyuca, 1 ♂, 2 ♀.

TURDUS ASSIMILIS RENOMINATUS Miller & Griscom

Chilpancingo, 6 ♂, 2 ♀.

TURDUS MIGRATORIUS PERMIXTUS subsp. nov.

Type. No. 163992, Mus. Comp. Zool.; ♂ ad., breeding; Guerrero, Chilpancingo (8,000 ft.); March 25, 1932; W. W. Brown.

Characters. Resembling *phillipsi* Bangs of eastern Mexico in averaging smaller than *propinquus*; differing radically in color from both in being much blacker (♂) or slatier (♀) above, and below deeper cinnamon-rufous (♂) or more rufous, less ochraceous (♀); in color almost

exactly like the dark extreme of typical *migratorius* from northeastern North America and approximating it in size, but immediately separable by the absence of the white tail spots.

Remarks. This very distinct race is represented by three males and eight females, the majority of them taken in May and June. A table of wing measurements is appended below.

	♂	♀
<i>propinquus</i> — Rocky Mts.	135-148 (142)	130-138 (135)
“ — N. W. Mexico	138-142 (140.3)	131-135 (133)
<i>phillipsi</i> — type series	132-133 (132.5)	123.5-132 (127.5)
<i>permixtus</i> — Guerrero	133.5-136.5 (134.7)	127-134 (130)

HYLOCICHLA GUTTATA AUDUBONI (Baird)

Taxco, 2 ♂ (wing 100.5 & 102) Oct. 16 & 17, 1930; Chilpancingo. 1 ♂ (wing 104), Nov. 11, 1931.

CATHARUS OCCIDENTALIS FULVESCENS Nelson

Chilpancingo, 1 ♂, 2 ♀, breeding.

CATHARUS MELPOMENE CLARUS Jouy

Chilpancingo, 4 ♂, 4 ♀, May-August.

The Mexican races of this thrush are unsatisfactory. The situation is precisely like that in *Myadestes obscurus*, and many other species. The darkest and most russet birds (typical *melpomene*) are from Vera Cruz. The palest extreme is in northwestern Mexico in Chihuahua. Birds from San Luis Potosi, Mexico, Morelos, Guerrero and Jalisco are exactly intermediate, and it is to these that the name *clarus* applies. Unlike the *Myadestes*, however, the extremes are not so strikingly distinct, and I do not believe that the formal separation of Chihuahua specimens of *Catharus melpomene* is necessary or advisable.

SIALIA SIALIS FULVA Brewster

Chilpancingo, 1 ♂, March 20, 1932.

Presumably some form of Bluebird breeds in the mountains of Guerrero, but no specimens are on record. In so critical a group of subspecies, the determination of a single specimen is provisional only. I refer this bird to *fulva*, as it agrees with that race in size, in being more azure blue above, and in having the underparts extensively

cinnamon rufous in little contrast with the white belly. The cinnamon rufous is not however, as pale as in *azurea*, but it is not as dark as in *guatemalae*.

RIDGWAYIA PINICOLA (Sclater)

Chilpancingo, 3 ♂, 2 ♀, March–May.

The discovery of this species in Guerrero is a distinct range extension for this little known bird.

FAMILY SYLVIIDAE

CORTHYLIO CALENDULA CALENDULA (Linnaeus)

Chilpancingo, 1 ♀, Nov. 15, 1931; Taxco, 1 ♀, Nov. 15, 1930.

POLIOPTILA CAERULEA CAERULEA (Linnaeus)

Chilpancingo, 1 ♂, Feb. 2, 1932; Taxco, 1 ♀, Oct. 10, 1930.

POLIOPTILA BILINEATA NIGRICEPS Baird

Chilpancingo, 1 ♂, 1 ♀, Aug. 25 & Oct. 10, 1931; Coyuca, 1 ♂, Jan. 15.

FAMILY PTILOGONATIDAE

PTILOGONYS CINEREUS PALLESCENS subsp. nov.

Type. No. 164037, Mus. Comp. Zoöl.; ♂ ad.; Chilpancingo (8,000 ft.), Guerrero, Mexico; Nov. 25, 1931; W. W. Brown.

Characters. Similar to typical *cinereus* of Mexico and Vera Cruz, but paler and greyer throughout; male with supraloral, chin and throat greyish white, never brownish white; auricular region and nuchal collar greyer, less brown; slightly paler and clearer grey both above and below; female with cap and throat greyer, less drab, more sharply contrasted with back and breast; above and below averaging paler and less brown, the darkest specimens about like the palest Vera Cruz specimens; rump averaging lighter than back and upper tail coverts darker than in typical form.

Remarks. This new race is founded on 5 ♂ and 8 ♀. Specimens collected from October–December are in fresh plumage, those from April to May variously worn. In making comparisons care must be

used to contrast similar plumages. When this is done, the characters of the new form are readily appreciable in series. A specimen from Jalisco is distinctly intermediate.

FAMILY VIREONIDAE

VIREO FLAVOVIRIDIS FLAVOVIRIDIS (Cassin)

Chilpancingo (5,000–8,000 ft.), 2 ♂, 1 ♀, April 5–May 25.

These birds are of some interest, as in color characters they are *forreri* of the Tres Marias Islands. In size, however, they are well below the minimum recorded for this form.

VIREO GILVUS SWAINSONII Baird

Chilpancingo, 2 ♂ 2 ♀, Oct. 1–March 20.

VIREO SOLITARIUS CASSINI Xantus

Taxco, 2 ♂, 1 ♀, Oct. 10–25; Cacalotenango, 1 ♂, Nov. 10; Chilpancingo, 1 ♂, Jan. 7.

VIREO SOLITARIUS PLUMBEUS Coues

Chilpancingo, 1 ♂, April 20, worn breeding bird.

VIREO HYPOCHRYSEUS HYPOCHRYSEUS Sclater

Chilpancingo, 11 ♂, 6 ♀, Taxco, 2 ♂, April 14 to Oct. 11.

One of these Taxco specimens has a remarkably deformed or abnormal bill, in that both upper and lower mandible are strongly decurved beyond the middle, producing a markedly curved bill like a sickle.

VIREO BELLII BELLII Audubon

Chilpancingo, 1 ♂, Feb. 15; Coyuca, 3 ♂, 4 ♀, Jan. 26–April 15, 1931.

FAMILY VIREOLANIIDAE

VIREOLANIUS MELITOPHRYS GOLDMANI Nelson

Chilpancingo, 1 ♂, May 11, 1932.

In default of topotypical material, the subspecific determination is tentative only.

FAMILY COEREBIDAE

DIGLOSSA BARITULA BARITULA Wagler

Chilpancingo, 1 ♂, April 30, 1932.

FAMILY MNIOTILTIDAE

MNIOTILTA VARIA (Linnaeus)

Coyuca, 1 ♀, Jan. 15; Chilpancingo, 1 ♂, Nov. 29.

VERMIVORA CELATA LUTESCENS Ridgway

Taxco, 1 ♂, Oct. 22, 1930; Coyuca, 1 ♂, Feb. 27; Chilpancingo, 1 ♂, 3 ♀
Jan. 4–March 8.

These birds are by no means typical of *lutescens*, and should be referred to *orestera*, were that race ever recognized.

VERMIVORA RUFICAPILLA RUFICAPILLA (Wilson)

Chilpancingo, 1 ♀, Oct. 15, 1931.

VERMIVORA RUFICAPILLA RIDGWAYI van Rossem

Coyuca, 1 ♂, Jan. 26; Chilpancingo, 2 ♀, Nov. 29–March 5.

VERMIVORA VIRGINIAE (Baird)

Chilpancingo, 3 ♀, Feb. 7–March 27, 1932.

The furthest south this species has ever been recorded.

DENDROICA AESTIVA AESTIVA (Gmelin)

Chilpancingo, 2 ♂, April 5, 1932.

DENDROICA AESTIVA BREWSTERI Grinnell

Chilpancingo, 3 ♂, 1 ♀; Pié de la Cuesta, 1 ♂; Coyuca, 1 ♂, 2 ♀; Dec. 11–
May 7.

DENDROICA AESTIVA SONORANA Brewster

Coyuca, 2 ♀, Chilpancingo, 1 ♀, Nov. 25–March 11.

DENDROICA AUDUBONI AUDUBONI (Townsend)

Coyuca, 1 ♂, 1 ♀; Chilpancingo, 1 ♂, 2 ♀, Taxco, 3 ♀; Oct. 9–Jan. 15.

DENDROICA DOMINICA ALBILORA Ridgway

Acapulco, 1 ♂, Dec. 20, 1931.

DENDROICA NIGRESCENS (Townsend)

Chilpancingo, 2 ♂, 1 ♀; Taxco, 1 ♂, 2 ♀; Oct. 1–Dec. 21.

DENDROICA OCCIDENTALIS (J. K. Townsend)

Taxco, 1 ♀, Oct. 10.

DENDROICA TOWNSENDI (J. K. Townsend)

Taxco, 3 ♂, 1 ♀; Chilpancingo, 2 ♀; Oct. 9–Nov. 11.

OPORORNIS TOLMIEI (Townsend)

Chilpancingo, 3 ♂, 3 ♀; Coyuca, 1 ♂, 5 ♀; Oct. 1–April 1.

GEOTHLYPIS TRICHAS OCCIDENTALIS Brewster

Coyuca, 1 ♂, Feb. 11.

ICTERIA VIRENS VIRENS (Linnaeus)

Coyuca, 3 ♂, 2 ♀; Acapulco, 1 ♀; Jan. 7–April 20.

Four of these birds are intermediate in being greyer, less green above or in having longer tails.

ICTERIA VIRENS LONGICAUDA (Lawrence)

Acapulco, 1 ♀, May 4; Coyuca, 1 ♂, Feb. 18.

WILSONIA PUSILLA PILEOLATA (Pallas)

Taxco, 1 ♂, 1 ♀; Chilpancingo, 1 ♂, 1 ♀; Sept. 29–Dec. 31.

SETOPHAGA PICTA PICTA (Swainson)

Chilpancingo, 2 ♂, June & September.

ERGATICUS RUBER (Swainson)

Chilpancingo, 1 ♂, June 9.

EUTHLYPIS LACHRYMOSA Cabanis

Chilpancingo, 3 ♂, 3 ♀; Cacalatenango, 1 ♂; May to October.

The excellent series before me fully endorses Mr. van Rossem's recent criticism of the race *tephra* Ridgway, which I regard as a pure synonym of *lachrymosa*. (cf. Trans. San Diego Soc. Nat. Hist., 6, No. 19, 1931, p. 286).

BASILEUTERUS RUFIFRONS DUGESI Ridgway

Chilpancingo, 15 ♂, 12 ♀, throughout the year.

FAMILY ICTERIDAE

CASSICULUS MELANICTERUS (Bonaparte)

Acapulco, 1 ♂, 1 ♀; Coyuca, 2 ♂, 4 ♀.

TANGAVIUS AENEUS ASSIMILIS (Nelson)

Chilpancingo, 5 ♂, 4 ♀; Coyuca, 1 ♀.

MOLOTHRUS ATER ARTEMISIAE Grinnell

Tixtla 1 ♂, 1 ♀; Chilpancingo, 1 ♂, 6 ♀; Dec. 10–March 17.

MOLOTHRUS ATER OBSCURUS (Gmelin)

Tixtla, 5 ♂, 2 ♀; Chilpancingo, 12 ♂, 10 ♀; Dec. 21–April 17.

CASSIDIX MEXICANUS OBSCURUS (Nelson)

Chilpancingo, 6 ♂, 3 ♀.

STURNELLA MAGNA ALTICOLA Nelson

Chilpancingo, 2 ♂, 2 ♀, March–May 25.

A Review of the Middle American Meadowlarks

For some years the status of the various proposed races of Neotropical Meadowlarks has been in doubt and confusion. Dr. Chapman has recently (Bird-Life of Mts. Roraima and Duida, pp. 133-135) proposed a tentative but most workable review of the South American races, emphasizing the elusive nature of subspecific variation, complicated by great seasonal variation. These comments apply with equal force to the Middle American forms. Small series of *Sturnella* from various parts of Mexico and Central America have gradually been accumulating in the great eastern museums, and the time has now come, when a revision could be attempted with reasonable hope of improving current conceptions or at least clarifying certain issues of fact. Outram Bangs and I commenced this review in August, 1932, and proceeded as far as we could go without the re-examination of critical specimens or series in other museums. Among the last things my late colleague did was to borrow this material from the American Museum in New York and the Carnegie Museum in Pittsburg. While he did not live to examine it, thanks is hereby extended to the authorities in charge of these collections for their courteous assistance.

For Middle American Meadowlarks three names are available at present. Of these the oldest is *mexicana* Sclater, based primarily on birds collected by De Oca at Jalapa, Vera Cruz, although Sclater also included specimens from Cordova and Orizaba. If, then, any question arises as to just what *mexicana* is, in default of the type, topotypes collected by De Oca must be used. Fortunately the American Museum possesses two. In 1888 Ridgway received specimens from the Segovia River. They proved to be very small, and were described as *inexpectata*. In the meantime specimens were accumulating from the highlands of Mexico. These birds proved to be relatively very large, and in 1900 Nelson described them as *alticola*, the type from the mountains of Chiapas. Unfortunately he did not compare it with *mexicana*, to which it is exceedingly close, but to typical *magna*, from which, of course, it is very different. When Ridgway reviewed *Sturnella* in 1902 (Birds of N. & Mid. Amer., pt. 2), he was unable "satisfactorily to make out Mr. Nelson's *alticola*," and called all large highland birds *mexicana*, and all small birds from the Caribbean lowlands *inexpectata*. In 1932 when reporting on the meadowlarks of Guatemala (Birds of Guatemala, p. 389), I gave a table of measurements of such specimens as I had examined in New York and Cambridge. This table, reproduced beyond, shows very clearly that topotypes of *mexicana* from

5,000 ft. on the eastern slope of the Mexican plateau are intermediate between the small lowland birds and the generally large bird of the highlands. As, however, the size of Jalapa birds was nearer the maximum for lowland birds than the minimum for highland birds, I suggested that the name *mexicana* could be applied to the lowland form and *alticola* was available for the highland form. We had here then one of those inconvenient cases where the oldest name proves to be based on an intermediate, and where its application to one or another well marked extreme must be arbitrary and always open to criticism.

Most fortunately, however, the present study has brought out additional characters, which obviate the necessity of treating either *alticola* or *inexpectata* as a synonym of *mexicana*. The tail pattern of east Mexican birds proves to differ from that of true *inexpectata* and *alticola*, and on this basis the slightly larger size of Jalapa topotypes can be waived. I distinguish the following races.

1. *Sturnella magna mexicana* Selater. Type locality, Jalapa (5,000 ft.), eastern slope of the mountains of Vera Cruz. Inhabits the lowlands of Vera Cruz, Oaxaca and Chiapas. Freely intergrading with *alticola* at medium altitudes. A relatively small race with short blunt culmen and long slender legs and long tail; three outer tail feathers with a short dusky streak near end of outer web; fourth tail feather with far more white than dusky on inner web; wing of males 99.6–108.5, the exposed culmen 19–21; the tail 66–70.5; the tarsus 43–46.

2. *Sturnella magna* subsp. Rio Lagartos, arid tip of Yucatan Peninsula. The Meadowlark is previously unrecorded from any part of the Yucatan Peninsula. The single adult ♂ is notably paler and duller yellow below than any other Middle American Meadowlark in equally or more worn plumage. I prefer to see this difference confirmed by other specimens. In other respects exactly resembling *mexicana*.

3. *Sturnella magna inexpectata* Ridgway. Type locality, Segovia River, Honduras. Inhabits the local pine land savannas of the Caribbean lowlands from (Peten?), British Honduras to northeastern Nicaragua. A very small race, in proportions similar to *mexicana*. Sides of chest averaging more heavily spotted rather than streaked. Third rectrix with much dusky on inner web, often the feather half and half dusky and white; fourth rectrix with far more dusky than white, the white often reduced to a narrow shaft stripe. Wing 96.5–105.5.

4. *Sturnella magna alticola* Nelson. Type locality, Ocuilapa, Chiapas. Inhabits the southern end of the Mexican Plateau at higher altitudes, east to western Vera Cruz (Mt. Orizaba), north perhaps to Jalisco

and Tepic; south through the highlands of Central America to Costa Rica. Size relatively large, but proportions similar to *mexicana*. Tail pattern as in *mexicana*, but averaging even more white, the outer webs of the outer feathers often devoid of any terminal dusky streak or this greatly reduced. This subspecies is by no means uniform throughout its range. Birds from Chiapas, Oaxaca and Vera Cruz southward are as dark as *mexicana* in general coloration. Birds from western and northwestern Mexico are the largest, slightly paler above and tend to have more white in the tail feathers. The very largest birds come from northwestern Mexico, the very smallest from Nicaragua and Costa Rica. Lack of material prevents me from discussing the relations of northwestern specimens (presumably *lilianae*) to *hoopesi* of the Mexican border. For measurements, see table. In Nicaragua and Honduras, this race intergrades eastward with *inexpectata*. A ♂ before me from Comoapa, Nicaragua (2,600 ft.) is such a specimen, the wing 106 and the tail feathers with more dusky than *alticola*, but more white than *inexpectata*.

5. *Sturnella magna subulata* subsp. nov. Type, No. 109448, Mus. Comp. Zoöl.; ♂ ad.; Boquete (4,000 ft.), Pacific slope of Chiriqui, western Panama; Jan. 30, 1901; W. W. Brown. Inhabits the savannahs of the Pacific slope of Chiriqui and Veraguas to Agua Dulce. Size very small and coloration dark as in *inexpectata*, consequently abruptly smaller than *alticola*; minutely deeper and richer yellow below than *alticola*; juvenals with far more wash of a darker brown below; tail feather pattern as in *alticola*, consequently with far more white than *inexpectata*; proportions quite different from *inexpectata* and the other subspecies, the tail and tarsus shorter, the bill longer and more slender, the mandible with a subulate and more pointed tip; wing 97-103; tail 61.5-66.5; tarsus 41-43; exposed culmen 21.5-25. Some time ago I provisionally referred these birds to *parakios* Bangs of Santa Marta. As the latter race is now understood, they prove to be quite different.

6. *Sturnella magna meridionalis* Selater. Type locality, Bogotá Savanna, Colombia. Resembling *alticola* in large size and dark coloration, but light tips and edges to feathers of hind neck greyish or whitish instead of buffy; black jugular crescent broader; bill 3-5 mm. longer; tail pattern as in *inexpectata*, consequently much darker than in *alticola*.

7. *Sturnella magna parakios* Bangs. Type locality, San Sebastian, 6,000 ft., Santa Marta, Colombia. Radically different from any other race discussed so far in being paler and browner above, with less black

to the centers of the feathers; the crown stripes chiefly dark brown instead of chiefly blackish; hind neck buffy as in the Central American races; size slightly smaller than *alticola* and *meridionalis*, much larger than *subulata*, wing 107-110; the bill shorter than in *meridionalis*; radically different from all previous races in having more white in the tail even than *alticola*, the *fifth* feather from the outermost always with some white.

8. *Sturnella magna praticola* Chubb. Type locality, Abary River, British Guiana. Resembling *paralios*, but much smaller, the inner web of third rectrix from without always with some grey or dusky on inner margin, at least for basal half.

I have given here brief diagnoses of some of the South American races, as no one has previously contrasted any of them with the Central American forms. Geographically the nearest South American meadow-larks to *subulata* are in northern Colombia. I have before me 4 from Boyaca and 13 from the lower Magdalena, kindly loaned by the Carnegie Museum. These birds in general coloration and size resemble *paralios*, but the tail feather formula is that of *praticola*. It is obviously a matter of opinion to which race to refer them, but I agree with Todd in calling them *paralios*. In the first place there are only 4 authentic males of *paralios*, and further specimens might produce smaller birds with some dusky on the third tail feather. In the second, to call these birds *praticola* would give that race a remarkably discontinuous range.

Wing Measurements of Males

topotypes of <i>mexicana</i> Sclater ¹	105-108.5 collected at Jalapa by De Oca
type of <i>alticola</i> Nelson	113, highlands of Chiapas
topotypes of <i>inexpectata</i>	96.5 from Segovia River, east Nicaragua
10 Vera Cruz lowlands ¹	99.6-103.5 (102.6) = <i>mexicana</i>
5 Chiapas lowlands	101.5 = <i>mexicana</i>
5 British Honduras	99-105.5 = <i>inexpectata</i>
6 highlands of eastern Mexico	115.6 = <i>alticola</i>
3 Jalisco ¹ & Tepic	114-118 = subsp.?
2 Guerrero	113-114 = <i>alticola</i>
1 Oaxaca	109 = intergrade with <i>mexicana</i>
5 from western Mexico	116.3 <i>alticola</i> or <i>lilianae</i>
3 western Guatemala ¹	112-114 = <i>alticola</i>
3 central Honduras	111-114 = <i>alticola</i>
4 north central Nicaragua ¹	108.2-113 = <i>alticola</i>

¹ American Museum of Natural History.

1 Comoapa, Nicaragua	106 = intergrade with <i>inexpectata</i>
9 Costa Rica	108-116 (111.3) = <i>alticola</i>
8 from western Panama	97-103 = <i>subulata</i>
3 Santa Marta	107-110 = <i>parabios</i>
19 Bogota & Santander ¹	111-118 = <i>meridionalis</i>
5 lower Orinoco	97-103 (fide Chapman = <i>praticola</i>)
11 lower Magdalena ¹	113-118, one very small bird probably a ♀

ICTERUS BULLOCKII (Swainson)

Taxco, 1 ♂, 1 ♀; Chilpancingo, 21 ♂, 4 ♀, Oct. 7-April 7.

ICTERUS SPURIUS (Linnaeus)

Acapulco, 1 ♂, 2 ♀; Coyuca 2 ♂, 3 ♀; Chilpancingo, 4 ♂, 1 ♀; Nov. 15-May 7.

ICTERUS WAGLERI WAGLERI Sclater

Chilpancingo, 4 ♂, 7 ♀.

These birds, like all other specimens from western Mexico examined, are typical *wagleri* in color, but approach *castaneopectus* Brewster of northwestern Mexico in size.

ICTERUS PARISORUM Bonaparte

Chilpancingo, 7 ♂, Dec. 1-March 25.

ICTERUS CUCULLATUS CUCULLATUS Swainson

Taxco, 1 ♂; Chilpancingo, 9 ♂, 1 ♀, Oct. 5-March 15.

Not previously recorded southwest of Morelos.

ICTERUS CUCULLATUS SENNETTI Ridgway

Taxco, 1 ♀, Nov. 1, 1930.

Obviously this subspecies in its duller paler coloration and shorter wing and tail. It has already been recorded from Yautepec, Morelos, on the Guerrero border.

¹ Carnegie Museum.

ICTERUS CUCULLATUS CALIFORNICUS (Lesson)

1 ♀, Chilpancingo, Feb. 7, 1932.

A typical and characteristic specimen of this race, which is unrecorded to date south of Tepic. For the use of this name see beyond under *pustulatus*.

ICTERUS GULARIS GULARIS (Wagler)

Coyuca, 1 ♀, Feb. 10.

An interesting range extension, the species previously unknown north of Oaxaca.

ICTERUS PUSTULATUS MICROSTICTUS subsp. nov.

Type. No. 114624, Mus. Comp. Zoöl.; ♂ ad.; Sonora, Guaymas; Feb. 22, 1905; W. W. Brown.

Characters. Differing from typical *pustulatus* (Wagler) in having the spotting on the back greatly decreased in adult males, small narrow lance-ovate ones instead of large round spots; this decrease in spotting equally evident in females, which are so small as to be very obscure.

Material Examined—*pustulatus*, 20 ♂, 11 ♀ from Morelos, Guerrero & Colima; *microstictus*, 20 ♂, 12 ♀ from Jalisco, Sinaloa and Sonora.

Remarks. The discovery that there were two strongly marked subspecies of *pustulatus* raised the question as to which one Wagler's type belonged. It was quite impossible to tell from the original description, which incidentally gave no locality, and there was no point in guessing, as the type was among the many treasures of the Berlin Museum. Accordingly I sent a typical adult male of each form to Dr. Stresemann, who very kindly made the necessary comparisons. My friend Mr. van Rossem has since been in Berlin and has also examined the original specimens. There prove to be three cotypes from Cuernavaca and San Mateo, collected by Deppe, and all are unquestionably the large spotted southern form.

In this connection we must consider *Pendulinus californicus* Lesson from California (Rev. Zoöl., 1844, p. 436). This name has always been regarded as a synonym of *pustulatus*, notably by Sclater and Ridgway, the locality supposedly an error, as was so frequently the case with Lesson's middle American birds. A study of the description, however, shows that it cannot possibly apply to *pustulatus*. It is, on

the contrary, a perfect description of a male *Icterus cucullatus nelsoni* not quite fully adult, and the locality in this case is entirely correct. The Arizona Hooded Oriole must consequently be called *Icterus cucullatus californicus* (Lesson). I am happy to report that this reference was called to my attention by Mr. van Rossem, who independently reached exactly the same conclusion.

FAMILY THRAUPIDAE

TANAGRA ELEGANTISSIMA (Bonaparte)

Chilpancingo, 2 ♂, December and April.

PIRANGA RUBRA COOPERI Ridgway

Chilpancingo, 1 ♀, Dec. 3, 1931.

Not previously recorded south of Colima.

PIRANGA LUDOVICIANA (Wilson)

Taxco, 3 ♂; Chilpancingo, 1 ♂, 4 ♀, October 10–Feb. 1

PIRANGA FLAVA HEPATICA Swainson

Chilpancingo, 12 ♂, 7 ♀, March 25–Dec. 1; Taxco, 4 ♂, 3 ♀, October.

With excellent series of breeding birds from Oaxaca, Guerrero and Jalisco before me, there is no doubt but what even larger breeding series from northern Sonora, Chihuahua, Arizona and New Mexico average a trifle larger, appreciably paler grey on the back, greener less orange on the forehead (females) and very faintly rosier below. I must fully endorse, therefore, Mr. van Rossem's critique in his recent paper on Sonora land birds (Proc. San Diego Soc. Nat. Hist., 6, 1931, pp. 290–291), where he recognizes the northwestern extreme as *oreophasma* Oberholser. The situation is obscured (1) by the migratory habits of the northern bird, (2) by the fact that the winter plumage of true *hepatica* is barely distinguishable from May and June specimens of *oreophasma*, and (3) by the fact that the type of *oreophasma* is an intermediate. The range originally assigned to it was far too extensive, as van Rossem points out. Nevertheless I must confess that *oreophasma* is, in my opinion, a very poor subspecies, as compared to every other Middle American race, and Mr. Zimmer can

scarcely be criticised for not recognizing such slight average differences in his recent review of this polymorphic species.

PIRANGA ERYTHROCEPHALA ERYTHROCEPHALA (Swainson)

Chilpancingo, 1 ♂, May 31, 1932.

This lovely little Tanager is still rare in collections. This Museum possesses five specimens from northern Chihuahua which are strikingly distinct in their paler and duller coloration from the typical form. The species was based on specimens from Mexico collected by Bullock at Temascaltepec. Swainson's description applies clearly to the more richly colored southern bird. So does the description of Salvin and Godman in the *Biologia*, and the colored plate of a specimen collected by White in the Dept. of Mexico exactly corresponds to the adult male from Guerrero. I consequently propose

PIRANGA ERYTHROCEPHALA CANDIDA subsp. nov.

Type. No. 222049, Mus. Comp. Zoöl.; ♂ ad.; Chihuahua, Hacienda de San Rafael; May 15, 1888; M. Abbott Frazar.

Characters. Adult male differing from typical *erythrocephala* in having the pileum pinkish vermilion rather than scarlet vermilion; this cap bordered by yellowish green feathers in marked contrast to olive green of back; throat paler and pinker; flanks greyish olive instead of olive green; female greyer, less olive above and whiter, less yellow below.

Ridgway records the species from Trompa, Chihuahua. The specimen is before me, but was collected by McCleod at La Triunfa.

Thanks to the kindness of the American Museum of Natural History, I have before me two adult males in their collection from Jalisco. These are as usual intermediate, the pink of the head almost as rich as in typical *erythrocephala*, but the flanks greyish olive as in *candida*.

FAMILY FRINGILLIDAE

HEDYMELES MELANOCEPHALUS MELANOCEPHALUS (Swainson)

Chilpancingo, 1 ♀, Nov. 15, 1931, large bird with large bill.

HEDYMELES MELANOCEPHALUS MACULATUS Audubon

Chilpancingo, 8 ♂, 4 ♀, March 25–Sept. 29.

The identification of these Grosbeaks involved a careful survey of our Mexican specimens, now finally determinable thanks to van Rossem's studies (cf. especially Auk, 1932, p. 489). It seems pretty clear that the type of *melanocephalus* is a particularly large winter migrant of the large Rocky Mountain race. The question still remains, therefore, what is the breeding bird of the Mexican plateau? It proves to be an ill-defined intermediate. Speaking only of breeding birds for the moment, typical *melanocephalus* breeds in the mountains of northern Chihuahua and Sonora. Typical *maculatus*, by which I mean specimens not trenchantly separable from California series, breeds at Oposura, Sonora (series). Breeding specimens from Nuevo Leon, Tamaulipas and Guerrero differ from *maculatus* in having a larger bill, about half way to the measurements of *melanocephalus*. Winter specimens may be almost anything. From Alamos, Sonora, we have extreme specimens of both races, and typical *maculatus* at Opodepe as late as May 8. Other winter specimens of typical *maculatus* come from Sinaloa (Escuinapa, Dec. 15, 1895), Colima (April 3, 1913) and Michoacan (Patzcuaro, April 4). Presumably the greater number of true *melanocephalus* winter in the eastern half of Mexico. In Chihuahua it is resident, as we have three specimens taken at Durazno in late December.

PHEUCTICUS CHRYSOPEPLUS CHRYSOPEPLUS (Vigors)

Chilpancingo, 1 ♀, Oct. 5, 1931.

This Grosbeak has never been recorded as far south as Guerrero, but its occurrence there is entirely consistent faunally.

GUIRACA CAERULEA INTERFUSA Dwight & Griscom

Chilpancingo, 1 ♂, 1 ♀, Feb. & March 14.

GUIRACA CAERULEA EURHYNCHA Coues

Coyuca, 1 ♂, Jan. 30; Chilpancingo, 14 ♂, 9 ♀, throughout the year, including good series of breeding birds.

Many of these specimens are intermediate between *interfusa* and *eurhyncha*, resembling the breeding birds of much of northwestern Mexico. In color the females are dark and rich like *eurhyncha*, but the bill is nowhere near as heavy and powerful as typical *eurhyncha* from Vera Cruz and the isthmus of Tehuantepec.

SPOROPHILA TORQUEOLA TORQUEOLA (Bonaparte)

Coyuca, 1 ♂; Chilpancingo, 4 ♂, 5 ♀, throughout the year.

This series is of interest in connection with another from Morelos in showing an approach to the little known *albitorquis* (Sharpe) from Oaxaca, which is alleged to have a white collar on the hind neck. Three of the adult males from Guerrero have a partial white collar and all the adult males from Morelos have a partial collar. No more can be done without a series from Oaxaca to determine the constancy of the collar there. In no case can *albitorquis* be more than a southern race of *torqueola*. Or it may well be a plumage phase only, which is paralleled in *aurita*.

AMAUROSPIZOPSIS genus novum

Diagnosis. Very close to *Amaurospiza* Cabanis of the rain forests of southern Central America and obviously representing it, but a larger bird with a proportionately shorter and deeper stouter bill; rictal bristles twice as long, greatly exceeding the plumules, and much stiffer; nostril large, with a marked operculum; culmen distinctly ridged, a groove just over the nasal fossae, extending forward two thirds of the way to the tip of the maxilla; maxilla with five other fainter ridges and grooves extending diagonally from the nostril to the commissure.

Type. *Amaurospizopsis relictus*.

AMAUROSPIZOPSIS RELICTUS spec. nov.

Type. No. 164702, Mus. Comp. Zoöl.; ♂ ad.; mountains above Chilpancingo, Guerrero, Mexico; May 19, 1932; W. W. Brown.

Description. Uniform dull greyish blue, slightly bluer on the lesser wing-coverts, greyer and paler on belly; chin dusky; loreal region black; sides of head below eye dusky; remiges blackish, the primaries narrowly edged externally with greyish, the secondaries very broadly with greyish blue; rectrices blackish, narrowly edged on outer webs with greyish blue; bill dusky, the lower mandible abruptly whitish for terminal third; legs and feet dusky; iris brown (note by collector); wing 69, tail 59, tarsus 19, culmen 9.5.

Discussion. The very rare and little known genus *Amaurospiza* belongs in a group of fringilline forms, which include the genera *Oryzoborus*, *Cyanocompsa*, *Sporophila*, *Euethia*, *Volatinia*, *Passerina*,

and probably *Melopyrrha*, *Loxipasser*, and still other more slender billed forms. They differ from each other chiefly in size, proportions, and color pattern, and above all in the relative size and proportions of the bill. In this latter respect *Amaurospiza* is about intermediate between *Sporophila* and *Volatinia*, but has a broader bill basally than either, thus resembling *Oryzoborus* and *Cyanocompsa*. All of these



Fig. 1. Structural details of *Amaurospizopsis*. Life size.

genera agree in having small round nostrils without any operculum in a short nasal fossa, and short, weak, rictal bristles, scarcely or not exceeding the plumules. The uniform style of coloration is, of course, common to many members of the group.

While, therefore, at first sight, Ridgway's key in the Birds of North and Middle America, Pt. I, does not disclose any striking and trenchant differences in structural characters, the very different distribution of these genera, the highly discontinuous or relict distribution of some of them, and the number of genera with representative

species all occurring in one locality, are all factors which point to the relative antiquity and constancy of these generic characters.

The genus *Amaurospiza* is an excellent illustration. Its bill characters and color pattern are a mere shuffle of those possessed by several others. It does not possess one single definite character of its own. But it occurs in a region where five other genera are commonly represented (tropical rain forests of southern Central America), and it reappears in west Ecuador and southeastern Brazil, always as a very rare bird, an obvious relict from a more successful past.

With *Amaurospizopsis* we have an exactly similar situation. In color characters it is a mere replica of *Amaurospiza*, at most subspecifically distinct. It does, however, possess some definite structural characters which are *sui generis*, and these are correlated with its occurrence in a faunal area uninhabited by any other genus of the group. In response to my explicit inquiry Mr. Brown writes that the type and only specimen seen was flushed from the ground among bushes in a mountain ravine in the pine forest above Chilpancingo. The female is unknown, but I have little doubt but that it will prove to be some uniform shade of brown, like *Cyanocompsa*, *Oryzoborus* and *Amaurospiza*. The measurements of the type are given in the table beyond.

We may now return briefly to the little known *Amaurospiza concolor* Cabanis, the type species of that genus. The adult male in Berlin was collected by Frantzius in "Costa Rica" before 1861. Five other specimens have since been collected in that country, four from Miravalles and Tenorio in northwestern Costa Rica, and one from Boruca in southwestern Costa Rica. Frantzius collected in the former region, but definitely did not in the latter. Cabanis' detailed description and measurements agree perfectly with specimens from northwestern Costa Rica before me. I consequently designate Miravalles, Costa Rica as a more definite type locality. Thanks to the kindness of the authorities of the American Museum of Natural History in loaning me their five specimens of this very rare bird, I have before me twelve specimens, all but three of the recorded specimens extant. Subspecific variation is as follows.

1. *Amaurospiza concolor concolor* Cabanis. Known definitely only from Miravalles and Tenorio, northwest Costa Rica. Size relatively small; adult male uniform dull blue of a distinctly greyish cast, especially on abdomen and vent; adult female rufescent or even tawny above, of a distinctly paler cast below. One ♂ and 2 ♀ examined.

2. *Amaurospiza concolor grandior* subsp. nov.

Type. No. 103811, American Museum of Natural History; ♂ ad.; Peña Blanca, humid Caribbean forest of eastern Nicaragua; June 5, 1909; W. B. Richardson.

Characters. Adult male a dark dull indigo blue, not so grey as in typical *concolor*; female colored as in *concolor*; a larger bird with a longer bill. Three ♂, 1 ♀ from the type locality and Rio Tuma examined.

3. *Amaurospiza concolor australis* subsp. nov.

Type. No. 164571, Mus. Comp. Zoöl.; ♂ ad.; Boquete (5,100 ft.), Chiriqui, Pacific slope of western Panama; Nov. 20, 1931; Rex. R. Benson.

Characters. Relatively small as in *concolor*; adult male indigo blue as in *grandior*; adult female dark mars brown above, paler below, not at all rufescent or tawny. One ♂ ad. from Boruca, southwest Costa Rica; 3 ♂ ad. 1 ♀ from Boquete, Chiriqui.

Remarks. The immature male apparently has the same plumage as the female. The male of typical *concolor* from Costa Rica has a few brown feathers of the immature plumage in the back. These are strongly rufescent or tawny as in the female. Judging by the description and measurements the adult male in the British Museum from Paraiso, Canal Zone belongs here.

Table of Measurements of Males

	Wing	Culmen	Depth of bill at gonys	Width of bill at base
<i>Amaurospizopsis</i>	69	9.5	7.8	9.2
<i>Amaurospiza</i> c. <i>grandior</i>	62.5-64	9.8-10.2	...	8.6-8.9
“ c. <i>concolor</i>	61.5	9.5	7.6	8.9
“ c. <i>australis</i>	59-63.5	9-9.5	6.8-7.3	8.6-8.9

VOLATINIA JACARINI ATRONITENS Todd

Coyuca, 1 ♂.

CARDINALIS CARNEUS Lesson

Acapulco, 1 ♂, 1 ♀; Coyuca, 4 ♂, 2 ♀.

SALTATOR GRANDIS VIGORSII Gray

Coyuca, 2 ♂ juv., 1 ♀.

SPINUS NOTATUS FORRERI (Salvin & Godman)

Chilpancingo, 1 ♂, May 11, 1932.

The Brewster Collection contains a very large series from northern Chihuahua. Thanks to the authorities of the American Museum of Natural History I have before me 15 specimens of *forreri* from Jalisco, with which the Guerrero bird agrees. Chihuahua birds have a bill about 1 mm. longer on the average, the adult males average a paler, less greenish yellow on the rump, and the females are much paler olive green above, with duller, paler streaking. The name *forreri* is based on specimens from Durango, and there is no telling to which of these extremes Durango specimens belong.

SPINUS PSALTRIA MEXICANA (Swainson)

Chilpancingo, 8 ♂, 2 ♀; Taxco, 1 ♂, 1 ♀; throughout the year.

CARPODACUS MEXICANUS MEXICANUS (Müller)

Chilpancingo, 26 ♂, 9 ♀, throughout the year.

These birds do not seem to show the slightest approach to the characters claimed for the little known *rosceiprctus* Sharpe from Oaxaca.

POECETES GRAMINEUS CONFINIS Baird

Chilpancingo, 1 ♂, 2 ♀, Oct. 13–Nov. 27, 1931.

CHONDESTES GRAMMACUS GRAMMACUS (Say)

Chilpancingo, 1 ♂, Feb. 22, 1932.

This specimen in its darker and broader streaking above and darker chestnut crown stripes is distinctly nearer typical *grammacus*, which has not previously been reported from so far south and west in Mexico.

CHONDESTES GRAMMACUS STRIGATUS (Swainson)

Taxco, 1 ♂, 1 ♀, Oct. 9, 1930; Chilpancingo, 6 ♂, 4 ♀, Oct. 27–Feb. 22.

PASSERCULUS SANDWICHENSIS ALAUDINUS (Bonaparte)

Chilpancingo, 2 ♀, Dec. 20–March 14.

AMMODRAMUS SAVANNARUM AUSTRALIS (Maynard)

Chilpancingo, 4 ♂, 2 ♀, Nov. 17–March 5.

In their smaller size, shorter tails, darker coloration above and richer buff below, this series must be referred to *australis*, which is now known to reach western Guatemala on migration.

AMMODRAMUS SAVANNARUM BIMACULATUS (Swainson)

Chilpancingo, 2 ♂, 10 ♀, Nov. 15–March 25.

AIMOPHILA HUMERALIS HUMERALIS Cabanis

Taxco, 2 ♂, 2 ♀; Chilpancingo, 10 ♂, 6 ♀; throughout the year.

Western Mexico is remarkable for the number of species in this genus, each with a very limited range. The fine series listed above, together with four from Morelos and another from Acapulco are surprisingly alike. Very worn breeding birds sometimes lose all sign of black streaks on the back, but in fresh fall and winter plumage each feather of the back has a broad black subterminal shaft stripe, affecting the terminal half or third of the feather. I was much surprised to find a fresh winter specimen taken Jan. 20, 1889 from Colima in the collection, a notable range extension for the species. It is quite distinct and is described below.

AIMOPHILA HUMERALIS ASTICTA subsp. nov.

Type. No. 111800, Mus. Comp. Zoöl.; ♂ ad.; Colima, Colima, Mexico; Jan. 20, 1889; collector not given, but undoubtedly W. B. Richardson from the handwriting on the original label.

Characters. Differing obviously from typical *humeralis* in lacking the black streaks on the back, these replaced by more diffuse dusky centers; rump concolor with back, instead of greyish brown, with or without (almost always) faint rufescent tips to some of the feathers.

AIMOPHILA ACUMINATA Salvin & Godman

Coyuca, 4 ♂, Feb. and March 1931.

In color this bird is a mere subspecies of *ruficauda*, but is so abruptly smaller than *lawrencii* of Oaxaca that I hesitate to reduce it, until a connecting link is discovered.

AIMOPHILA RUFESCENS SUBVESPERA subsp. nov.

Type. No. 164571, Mus. Comp. Zool.; ♀ ad.; Guerrero, Chilpancingo; March 2, 1932; W. W. Brown.

Characters. Size averaging larger than typical *rufescens* of Vera Cruz, wing of males 73-76.5 as against 67-74.5, about as in *pallida* Nelson and Palmer of Jalisco, but much smaller than *gigas* Griscom of western Guatemala; in fresh plumage paler and duller than *rufescens*, greyer and browner, less rufous on back and tail; crown stripes more rufous, less chestnut; in these respects even paler than *gigas*, but very close to *pallida*, not quite so pale; in worn breeding plumage very different from *rufescens*, as the greyer brown effect of the back is intensified, while *rufescens* becomes uniform rufous; immediately separable from *pallida* in any plumage by having black in the rufous crown stripes and a well marked grey central crown stripe.

Material Examined. *Rufescens*, large series from Vera Cruz and Vera Paz; *subvespera*, Guerrero, Chilpancingo, series of 36; Oaxaca, Tapanatepec, 1 ♂, 1 ♀; *gigas*, good series.

In so variable a bird it is by no means surprising that a fine series of perfect skins from a section of southwestern Mexico, where the species is previously unrecorded, should prove to be a distinct subspecies. With the type and a large series of *mcleodii* Brewster before me, it is evident that this is a mere northwestern extreme of *rufescens*. This name has ample priority over *pallida* Nelson & Palmer, which in characters is an intermediate between *subvespera* and *mcleodii*. It has, however, distinctive characters, readily recognizable in the series in New York, and occupies a sufficient geographic area to be worthy of recognition. I cannot, however, see the slightest excuse for the recognition of *sinaloa* Ridgway. I have never seen the unique type, but from Ridgway's description and comments, it would seem to be a specimen of *pallida* in very fresh plumage, which straggled down from the mountain pine forests, where *pallida* is common, to the adjacent foot hills.

AIMOPHILA RUFICEPS FUSCA (Nelson)

Chilpancingo, 18 ♂, 12 ♀.

This fine series must be assigned provisionally to *fusca*. The birds are distinctly more rufescent than *boucardi*, but as dark above as that race, consequently much darker than *scottii*. There is some confusion about the range of *fusca*. In his key Ridgway assigns Guerrero to the

range of *fusca*, but does not in the text, where he records *boucardi* from Tixtla, Guerrero. There is not the slightest question however, that the series listed above is not *boucardi*, unless large series from southern Tamaulipas and Neuvo Leon should prove not to be *boucardi*, which is based on a bird from Puebla. It is my impression that this species as regards Mexico badly needs revision. This cannot be done, however, until a good series from Puebla is collected, and until Oaxaca is searched for additional material to represent *australis* (Nelson).

AIMOPHILA BOTTERII BOTTERII (Sclater)

Chilpancingo, 2 ♂, 2 ♀.

JUNCO PHAEONOTUS PHAEONOTUS Wagler

Chilpancingo, 1 ♂, May 30.

SPIZELLA SOCIALIS ARIZONAE Coues

Chilpancingo, 1 ♂, Nov. 27.

SPIZELLA SOCIALIS MEXICANA Nelson

Taxco, 1 ♂, 3 ♀, Oct. 9–Nov. 10.

SPIZELLA PALLIDA (Swainson)

Chilpancingo, 4 ♀, Nov. 15–Jan. 10.

SPIZELLA ATROGULARIS (Cabanis)

Chilpancingo, 1 ♀, Feb. 21, 1932.

Previously unrecorded so far south.

MELOSPIZA LINCOLNII LINCOLNII (Audubon)

Coyuca, 1 ♂; Chilpancingo, 1 ♂, 2 ♀, Nov. 17–Feb. 25.

PASSERINA CIRIS PALLIDIOR Mearns

Coyuca, 1 ♂, 7 ♀; Taxco, 1 ♂; Acapulco, 1 ♂; Oct. 17–April 2.

PASSERINA CYANEA (Linnaeus)

Coyuca, 1 ♂; Naranjo, 1 ♀; Chilpancingo, 1 ♂, 1 ♀; Nov. 5–Feb. 27.

PASSERINA AMOENA (Say)

Chilpancingo, 2 ♂, Feb. 10 and March 15.

Previously unrecorded so far to the south.

PASSERINA LECHLANCHERI LECHLANCHERI (Lafresnaye)

Coyuca, 5 ♂, 2 ♀; Acapulco, 1 ♂.

The type locality for this beautiful little Bunting is Acapulco, Guerrero. The species has previously been represented in this Museum by 16 specimens from Oaxaca, and I was much surprised, upon comparing them with the topotypes recorded above, to discover that the Oaxaca birds are appreciably larger.

PASSERINA LECHLANCHERI GRANDIOR subsp. nov.

Type. No. 238393, Mus. Comp. Zool.; Chivela, Oaxaca; March 19, 1927; W. W. Brown.

Characters. Differing from typical *lechlancheri* of Guerrero in being a larger bird throughout.

	Wing of males	Females
<i>lechlancheri</i>	64-66 (65.2)	60-61 (60.5)
<i>grandior</i>	67.5-70.3 (68.8)	63-64.5 (63.9)

PASSERINA VERSICOLOR VERSICOLOR (Bonaparte)

Chilpancingo, 3 ♂, Jan. 25-March 15.

These three specimens are in winter plumage, and obviously represent typical *versicolor*.

PASSERINA VERSICOLOR PURPURASCENS Griscom

Chilpancingo, 1 ♂, March 27.

This specimen is not in winter plumage and stands out clearly from the three *versicolor* recorded above. This bird, with two definitely breeding specimens from Cuernavaca, Morelos, is intermediate between *versicolor* and *purpurascens*, but distinctly nearer the latter in color, though not in size.

MELOZONE RUBRICATUM RUBRICATUM Cabanis

Chilpancingo, 5 ♂, 4 ♀.

These birds and an equally good series from Morelos presumably represent true *rubricatum*. A good series (9) from northern Chihuahua is very different, a much paler and duller brown above, the pileum and duller paler rufous, and a slightly larger bird. Two birds from Tepic represent *xantusii* Lawrence. They are intermediate on the whole, but the coloration above, especially on the rump, is a brighter brown, less olive, greyish or hair brown. Should series from Colima, Jalisco and Sinaloa confirm the constancy of these characters, the Chihuahua bird should be described.¹

ARREMONOPS SUPERCILIOSUS SUMICHRASTI (Sharpe)

Acapulco, 1 ♀; Coyuca, 2 ♂, 2 ♀, January–April.

ATLAPETES PILEATUS PILEATUS Wagler

Chilpancingo, 1 ♂, April 21.

PIPILO TORQUATUS TORQUATUS Du Bus

Chilpancingo, 2 ♂, 3 ♀.

In default of comparative material, I follow Ridgway in assigning these birds to the typical subspecies.

BUARREMON BRUNNEINUCHUS (Lafresnaye)

Chilpancingo, 4 ♂.

The minor size variations of this finch cannot be correlated geographically, and had best be ignored. Birds from southwestern Mexico are notably larger than Vera Cruz specimens, and Guatemala birds belong here too. Specimens from Costa Rica and western Panama are small, like Vera Cruz birds, while Colombia and Ecuador skins are large again.

I do not recall any modern up-to-date list of the birds of a Mexican State, so I add a list of the species recorded from Guerrero, not secured by Brown.

¹This has since been done.

- Oceanodroma melania* (Bonaparte)
Nycticorax nycticorax hoaceli (Gmelin)
Accipiter cooperi (Bonaparte)
Dendrotyx macrourus striatus (Nelson)
Philortyx fuscatus (Gould)
Cyrtonyx sallæi Verreaux
Dactylortyx thoracicus subsp.
Haematopus palliatus frazari Brewster
Heteractitis incana (Gmelin)
Chlidonias nigra surinamensis (Gmelin)
Sterna anaetheta nelsoni Ridgway
Anous stolidus ridgwayi Anthony
Larus heermanni Cassin
Columba flavirostris flavirostris Wagler
Oreopeleia albifacies rubida (Nelson)
Ara militaris mexicana Ridgway
Brothergys jugularis (Müller)
Amazona oratrix oratrix Ridgway
Coccyzus erythrophthalmus (Wilson)
Otus trichopsis trichopsis (Wagler)
Caprimulgus vociferus macromystax Wagler
Chordeiles acutipennis micromeris Oberholser
Streptoprocne zonaris mexicana Ridgway
Phaethornis longirostris mexicanus Hartert
Anthoscenus longirostris pallidiceps (Gould)
Campylopterus hemileucurus (Lichtenstein)
Eupherusa poliocerca Elliott
Lampornis margarethæ (Salvin & Godman)
Lampornis pringlei (Nelson)
Trogon ambiguus ambiguus Gould
Aulacorhynchus prasinus wagleri (Sturm)
Centurus hypopolius (Wagler)
Chloronerpes auricularis Salvin & Godman
Phloeoceastes guatemalensis nelsoni (Ridgway)
Xenicopsoides variegaticeps (Slater)
Automolus rubiginosus guerrensis (Salvin & Godman)
Xiphorhynchus flavigaster megarhynchus (Nelson)
Xiphorhynchus erythropygius erythropygius (Slater)
Lepidocolaptes lineaticeps insignis (Nelson)
Attila spadicea cinnamomea (Lawrence)
Pachyrhamphus major uropygialis Nelson
Mitrephanes phaeocercus tenuirostris Brewster
Deltarhynchus flammulatus (Lawrence)
Nuttallornis mesoleucus (Lichtenstein)
Myiochanes richardsonii sordidulus (Slater)
Empidonax difficilis difficilis Baird
Empidonax fulvifrons rubicundus Cabanis & Heine
Sayornis nigricans nigricans (Swainson)
Pitangus sulphuratus derbianus (Kaup)
Xanthoura luxuosa subsp.?
Cyanolyca mirabilis Nelson
Aphelocoma guerrensis Nelson
Nannorchilus leucogaster pacificus (Nelson)
Thryophilus pleurostictus subsp.
Thryophilus pleurostictus (? nisorius)
Thryophilus sinaloa ruscus Nelson
Catharus frantzii omiltemensis Nelson
Hylocichla ustulata ustulata (Nuttall)
Vermivora superciliosa subsp.
Granatellus venustus Bonaparte
Basileuterus belli clarus Ridgway
Chlorospingus ophthalmicus albifrons Salvin & Godman
Pipilo rutilus (Lichtenstein)

EXPLANATION OF PLATE

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Amaurospizopsis concolor Griscom.

About $\frac{1}{2}$ life size. Drawn and painted by Eugene N. Fischer.



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